PVP

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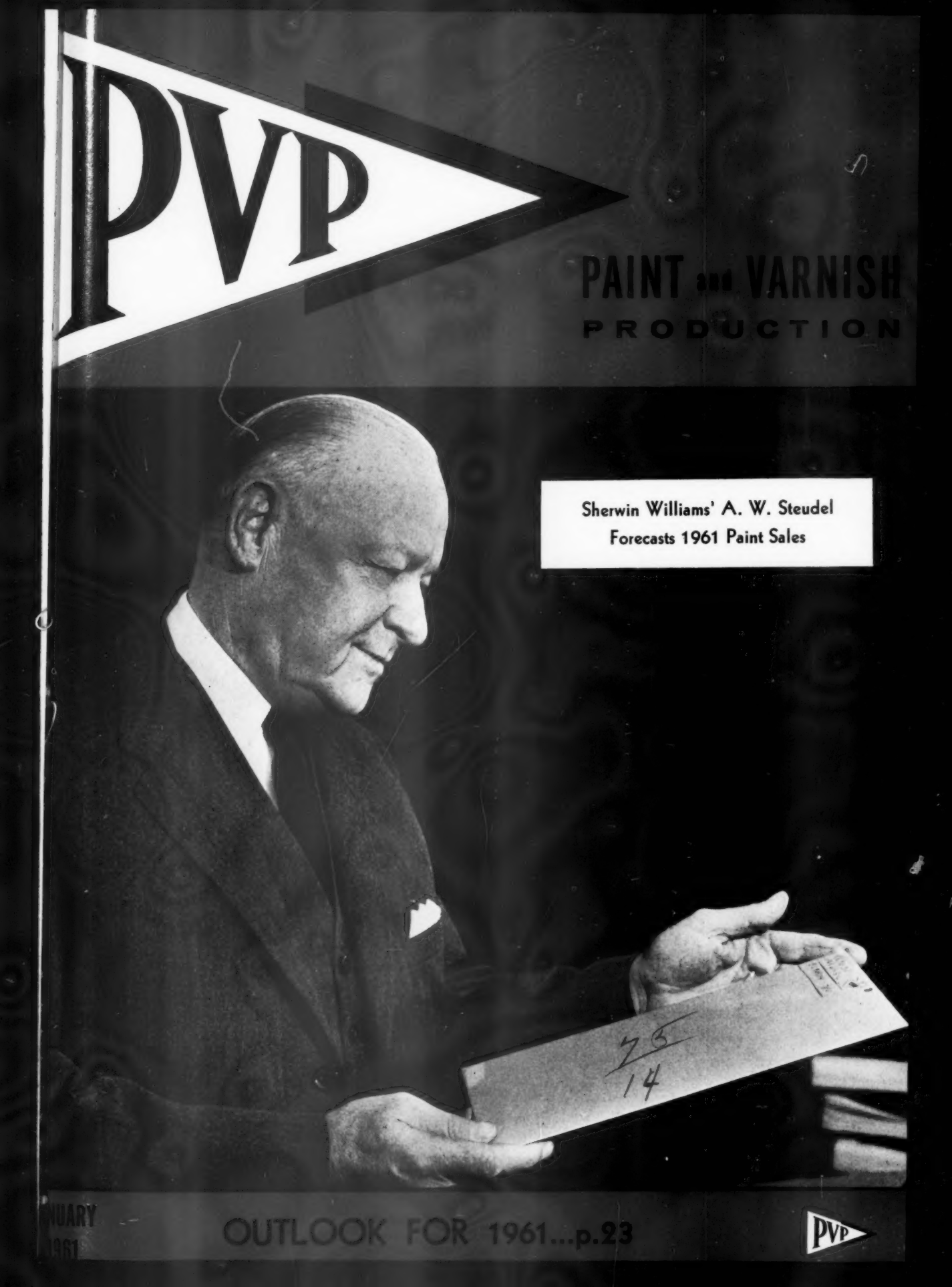
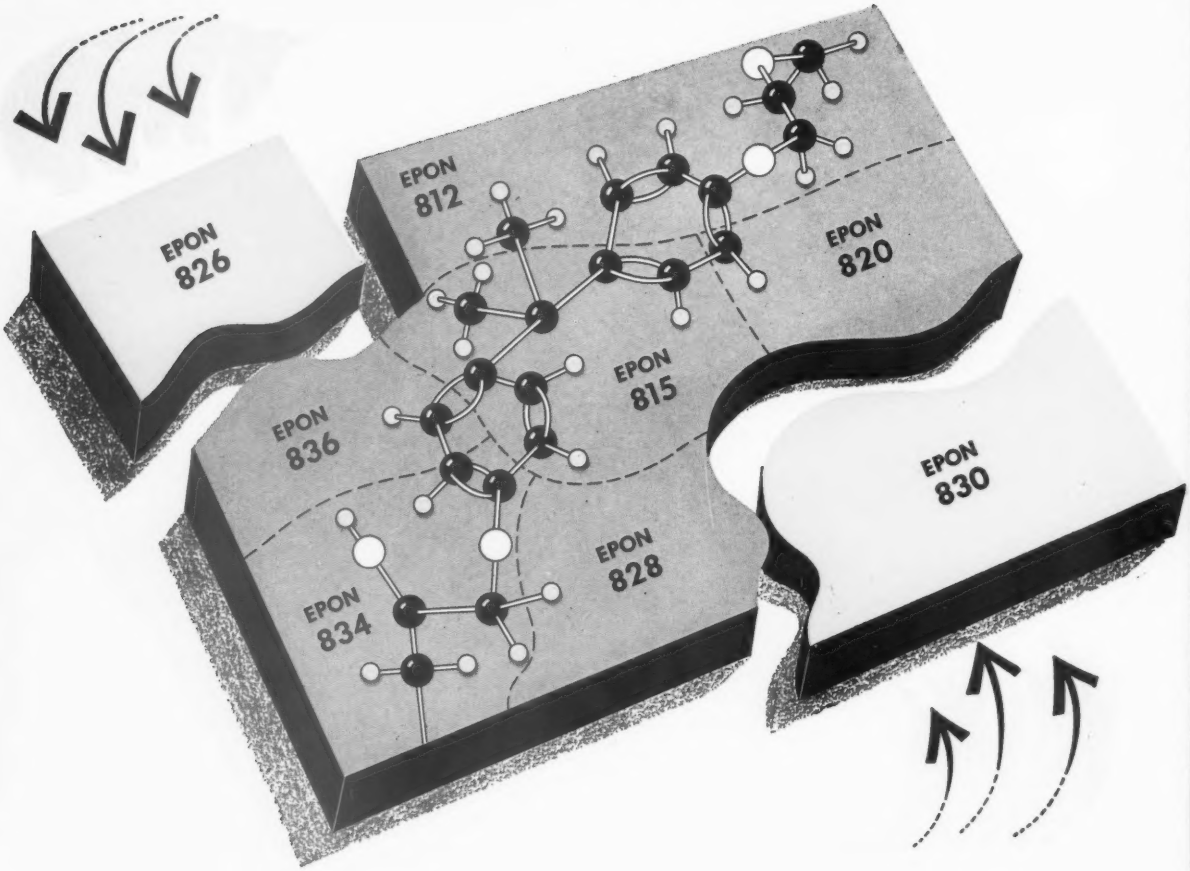


Sherwin Williams' A. W. Steudel
Forecasts 1961 Paint Sales

NUARY
961

OUTLOOK FOR 1961...p.23

PVP



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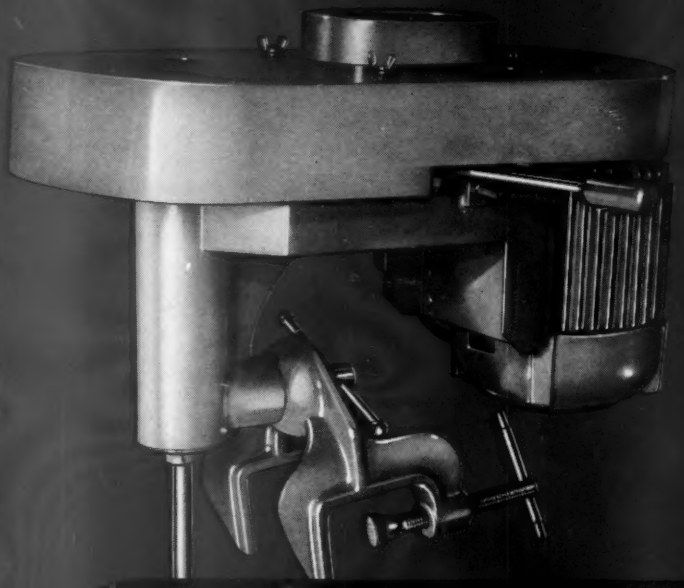

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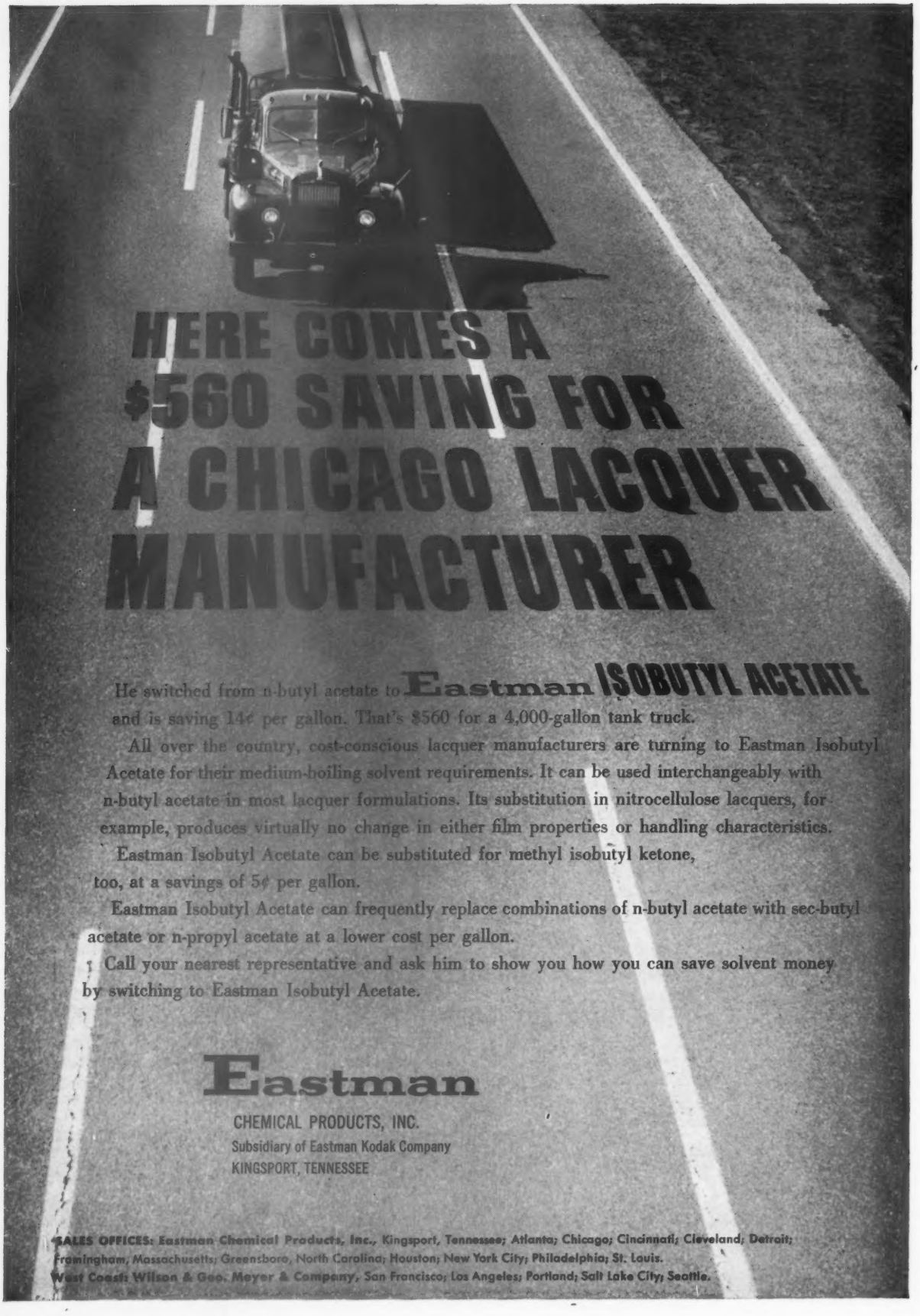
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JANUARY 1961

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NO. 1

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NEXT ISSUE

A comprehensive feature concerning the effect of radiation, humidity and atmospheric conditions on the performance of various paints and varnishes is scheduled for our February issue.

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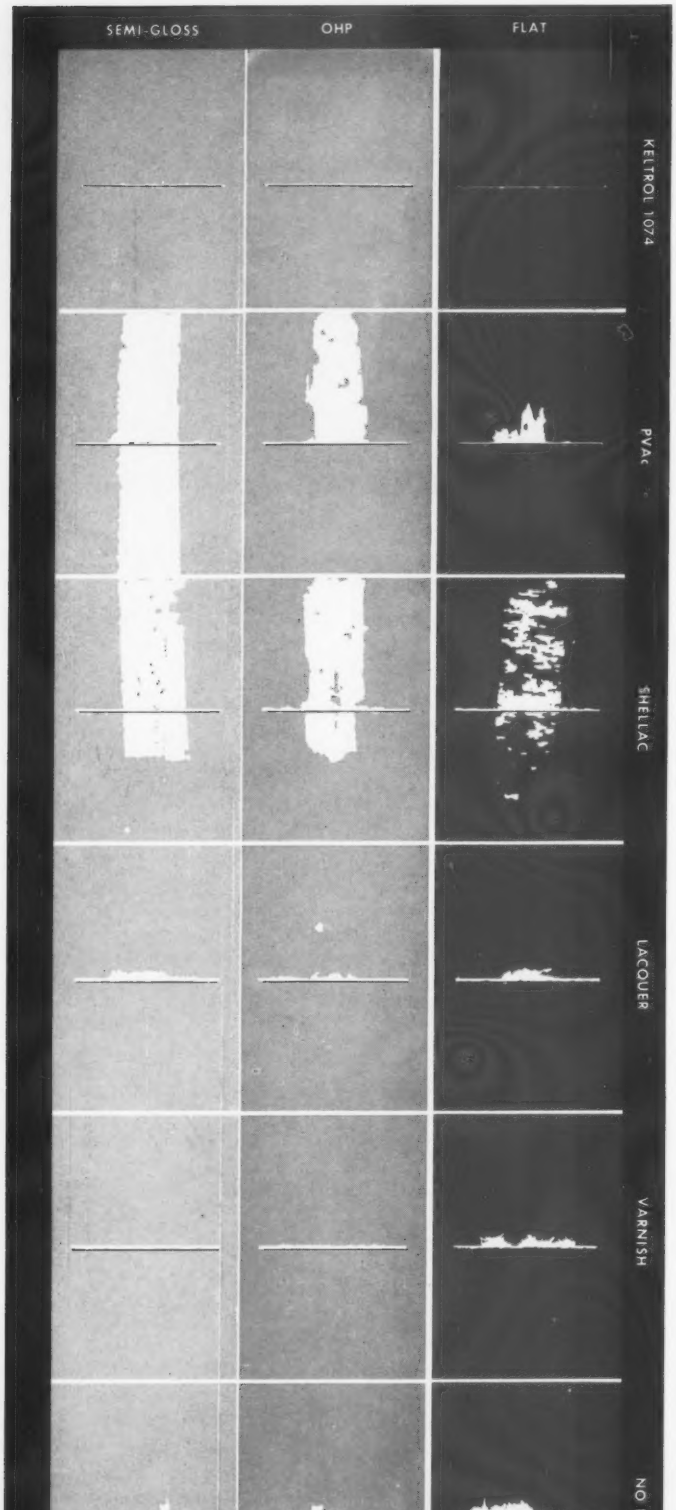

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EDITORIAL COMMENT

Progress Depends on Profits

THE rosy predictions of unprecedented growth for our economy made just a year ago fell very wide of the mark as 1960 ended on a "recessionary" note. Most economists now forecast a continuation of this downturn at least through the first quarter of this year.

However, business in recent weeks has been described as "mixed." Capital spending for new plants and equipment has steadily declined since last spring's peak of $36,300,000 and is expected to hit a low of $34,900,000 in the January-February-March interval of 1961.

However, the automobile industry had a very good year in 1960 as total volume hit close to 6,700,000 units. The enthusiastic reception of the 1961 models has been very encouraging and most automobile executives are confident that sales will remain at a high level throughout 1961. In addition, they predict that this year will be one of the most competitive years in the automobile's history as manufacturers offer a greater variety of models and sizes with a wider price range.

Outlays for construction in 1961 is expected to rise 4 percent to a record of $57.3 billion, surpassing the 1959 peak of $56.2 billion, according to the Department of Commerce.

The greatest strength in this year's construction picture will come from heavy engineering, and public construction. Private housing, the most important segment of the construction industry, will not be very impressive. Forecasts are that housing starts will reach some 1,350,000 units during 1961, representing a very slight increase over 1960. Rising vacancy rates, relatively high interest rates and rising construction costs are among the key factors adversely affecting the housing supply-demand situation.

1960 was a year of decreasing business for household appliances. The decline in housing starts, and the general low consumer demand for durable goods was reflected in poor appliance sales. Improvement in appliance sales is expected to come, but not before the second half of 1961 and this is based on the assumption that home building will begin to gradually rise in the months ahead.

There is one very encouraging factor in the economic picture, and this is concerned with defense spending. While its full impact is still months away, recent surveys show that military buying is on the rise. Increasing world tension coupled with the incoming administration's policy of keeping defense spending high will accelerate military buying. The net result will be a "shot in the arm" for our economy as new jobs are created and plants are expanded.

One of the disturbing features confronting business today has been the steady shrinkage of profit margins. In sizing up this situation, the First National City Bank in its December Letter on Business and Economic Conditions makes this comment:—

"Deterioration of corporate earning is a critical matter because it strikes at the very heart of our economic system. Profits are the motive force for enterprise and risk-taking; they are both symbol and substance of what makes our productive machinery go. Earnings from enterprise must be maintained at reasonable levels if we are to retain our forward momentum. The more we permit the profit share to shrink, the smaller the progress we are likely to make."

Without question, reversing this trend of shrinking profits will undoubtedly be the biggest challenge to face American business during 1961.

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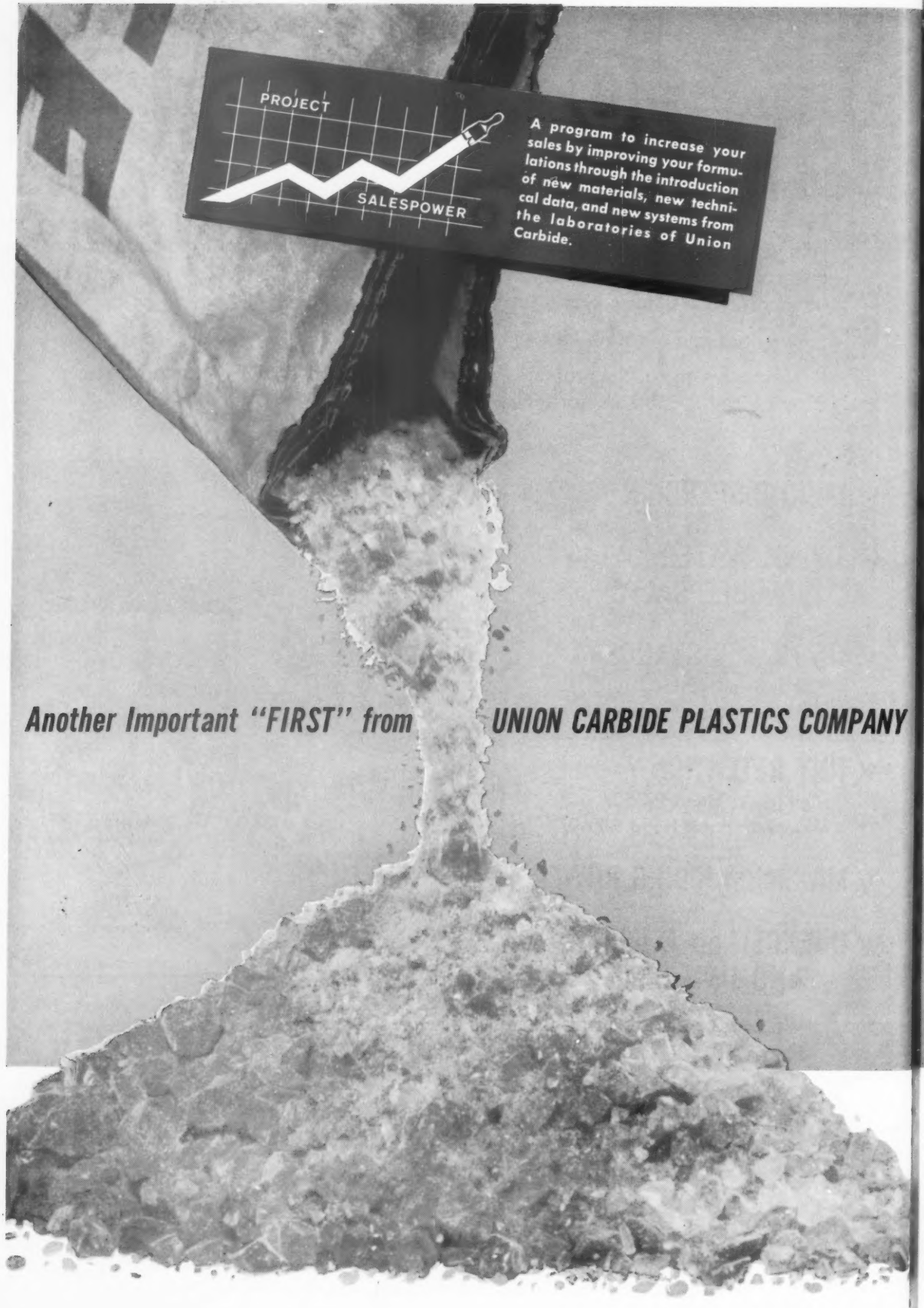
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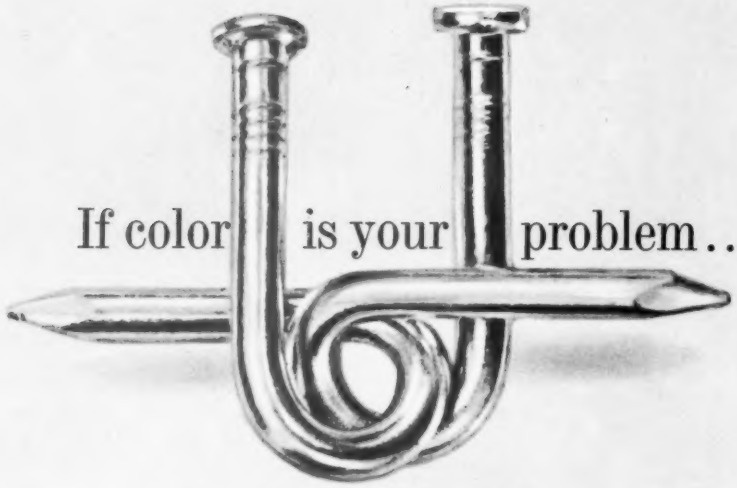

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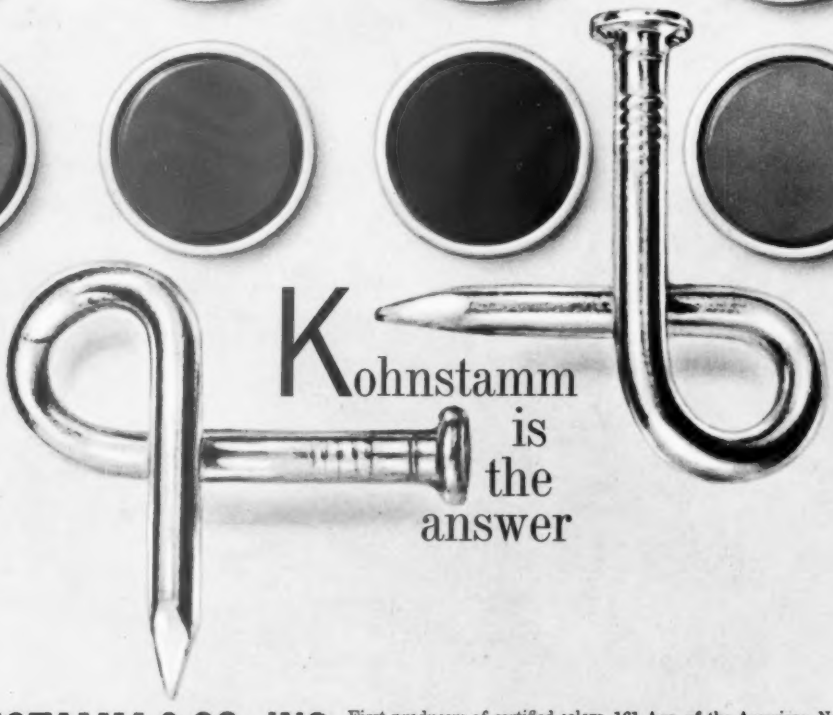

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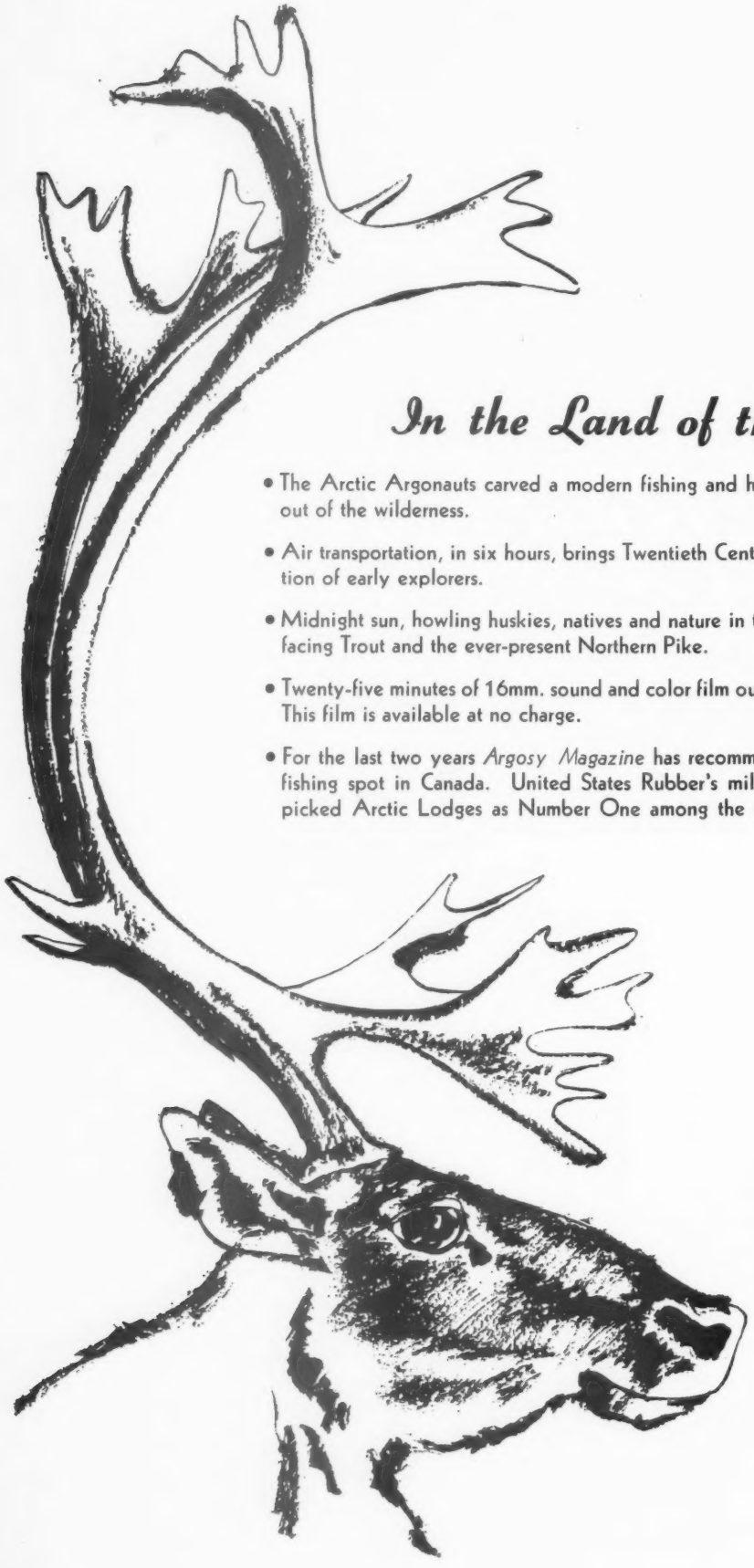

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For your copy of this new isopolyester bulletin, address your request to any Oronite office.

Note: This bulletin is a revised up-to-date edition of the original Maintenance Bulletin issued July 1959.

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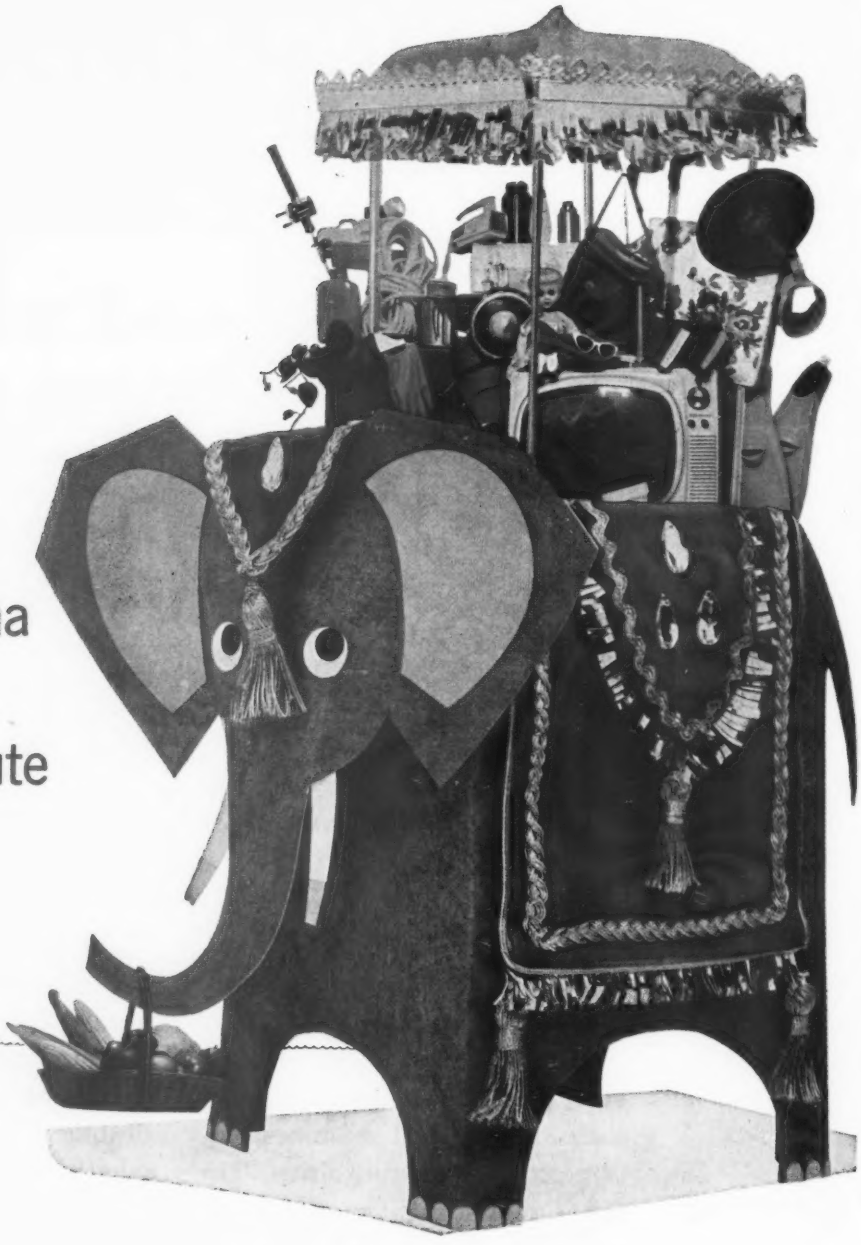
Vasco da Gama sailed an uncharted route



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OUTLOOK for 1961

Paint sales should top two billion dollar volume • Phthalic anhydride and rosin expected to remain tight during most of 1961 • Trend toward factory-finishing of building products will intensify during the year.

By
ANTHONY ERRICO
Editor

WHILE the paint industry registered some modest gains in 1960, total sales fell short of the two billion dollar volume predicted at the outset of last year. Estimates place the 1960 total sales volume at 1.8 billion dollars, an increase of about one million dollars over 1959.

Undoubtedly, one of the most important factors behind stagnant paint sales has been the downturn in residential construction, which was off some 15% from 1959. In industrials, we find that poor appliance sales, increased production of compact automobiles (which use less paint than conventional automobiles), and the general decreased demand for durable goods all have contributed to lower paint sales.

However, easier mortgage credit is expected to lift housing starts in 1961. According to the Department of Commerce, housing starts will reach beyond 1,300,000 units this year which is slightly above the 1960 level. But greater strength in heavy engineering construction, especially highways is predicted for the months ahead.

1960 ended on a recessionary note and most economists agree that this downturn is expected to continue, at least through the first quarter of 1961 followed by a decided improvement in the second quarter.

Can the paint industry push their sales beyond the 2 billion dollar mark in 1961?

Like any other business, the answer to this question depends on how fast and to what extent will the upturn in industrial activity be after this Spring.

One thing is certain, the cost of paint will go up this year. Because of higher raw material costs, increases in labor and freight expenses, many leading paint firms have recently advanced their prices to the dealer at an average of 3%. This is the first general price increase since 1957.

With the exception of phthalic anhydride and rosin, most paint raw materials are expected to be in good supply.

The following comprehensive discussion is concerned with the trends and developments which have taken place in paint raw materials in recent months. What effects these developments will have on the supply situation, formulation and manufacture are covered in the following paragraphs.

INTERMEDIATES

Phthalic Anhydride

The question uppermost in the minds of alkyd producers is when the current shortage of phthalic anhydride will end. Estimates are that this shortage will remain until at least the third quarter of 1961.

In a recent talk before the Vehicle Manufacturers Group of the New York Paint, Varnish and Lacquer Association, A. R. Hempel of Monsanto summed-up the present phthalic situation this way:

"Imported naphthalene in 1959 totalled 60 million pounds and estimates are that 1960 imports will show a drop to around 40 million pounds and to some 30 million pounds in 1961."

Hempel estimates that total production of phthalic anhydride will reach about 360 million pounds, a drop of over 100 million pounds originally forecasted for 1960.

With no immediate relief in sight for increased supplies of coke-

derived naphthalene, phthalic anhydride producers look toward the petroleum industry as another source of naphthalene to help fill the gap caused by a slow-down in steel production. Latest estimates are that by the end of 1961 and 1962 some 325 million pounds of petroleum naphthalene will be available, sufficient to produce 260 million pounds of phthalic anhydride. It is interesting to note that the steel mills are making studies to increase the capacity of naphthalene during this year, when demand for phthalic anhydride is expected to reach 400 million pounds.

Meanwhile Monsanto has begun construction of a phthalic anhydride plant near Camden, N. J., had developed a technique employing a versatile catalyst which allows phthalic manufacturers to use either naphthalene or o-xylene as starting materials in the fixed-bed plants. Presently, both Oronite and Amoco are producing phthalic from o-xylene and their combined capacity is around 35 million pounds a year. Production of o-xylene has been estimated around 125 million pounds for 1960, but will jump to over 400 million pounds in 1961. Foreign demands are the reason for this current boost in o-xylene production where it used to produce phthalic anhydride. However, since most of the 1961 volume of o-xylene is slated for foreign markets, it is apparent that increased production of phthalic anhydride from o-xylene cannot be realized during the next twelve months.

American Cyanamid's Bridgeville Pa. plant produces maleic anhydride at a rate of 20 million pounds annually. Production began in the early part of 1960.

This plant is scheduled to be completed by 1962 and will boost Monsanto's phthalic anhydride capacity more than 30 percent. Other companies announcing plans for increasing their phthalic anhydride capacity include Reichhold, Allied Chemical, and Witco. There has been some speculation that Hatco Chemical Division of W. R. Grace Company is building a phthalic plant with an estimated capacity of 50 million pounds per year; also Thompson Chemical Company of Pawtucket, Rhode Island is building a smaller unit which will have a production of 10 million pounds a year.

The production of phthalic anhydride via the o-xylene process received a big push when Scientific Design announced last summer it

A recent move by some coal tar producers to sell mixed naphthalenes is expected to help improve the phthalic anhydride shortage. The mixed streams contain naphthalene and two isomers, 1 - monomethylnaphthalene and 2 - monomethylnaphthalene. While it is known that these isomers can be converted into phthalic anhydride, they have two distinct disadvantages over straight naphthalene: (1) only 50-55% of the mononaphthalenes are converted to phthalic anhydride and (2) they cause processing problems. But in view of the very tight supply of naphthalene, phthalic producers are willing to use any material to boost their total production, even though conversion will be lower than obtained with straight naphthalene.

Isophthalic Acid

The phthalic anhydride shortage naturally has spurred many paint and vehicle manufacturers to look at isophthalic acid in alkyd formulation. In short-, medium-, and long-oil alkyds, isophthalic acid has had some success. It is reported that isophthalic acid will produce alkyd coatings that dry faster, are more flexible and tougher, and are more abrasion resistant than straight phthalic types. Presently, about 40% of the isophthalic production goes into alkyd resins.

Maleic Anhydride

Demand for maleic anhydride were satisfied by the summer of 1960 when increased production became available. Prior to that time, due to the vigorous growth in polyesters, demand exceeded plant capacity.

Production of maleic anhydride for 1960 is reported to reach 85 million pounds. Based on present plans for increased production and facilities, capacity of maleic anhydride is expected to jump to over 240 million pounds by 1962, creating an excess of this important chemical intermediate.

Biggest outlet for maleic anhydride is in polyester resins which should reach a volume of 380 million pounds a year by 1965. Quite a sizeable "chunk" of maleic anhydride (about 30%) goes into surface coatings such as a modifier for alkyds and for internally plasticizing PVAc emulsions.

Glycerine

Stability and adequate supply can be expected for refined glycerine in 1961.

While alkyd resins for coatings remain the single most important market for glycerine, other fields of use, such as cellophane, tobacco and toilet goods are primarily responsible for the growth factor that has raised glycerine disposition to a new high of 240 million pounds for the first ten months of 1960, up 8.3% from 1959.

A recent prediction based on the growth of phthalic anhydride consumption in alkyd resins suggests a 7% rise in this use over the next

five years. If this is borne out, an equivalent increase in glycerine consumption could be expected to follow, amounting to about 1 million pounds per year. Should experimental work on water-soluble or water-emulsion alkyds reach broad commercial success, this would add to this total, as glycerine appears to be a particularly compatible polyol in these formulations. Some progress has also been made with glycerine and derivatives in the polyurethane field—such as propylene oxide adducts of tri-functional polyols and mono- and di-glycerides of ricinolenic acid. However, the effect on glycerine consumption is still relatively minor.

Production of glycerine from fats is expected to hold fairly steady, and plenty of capacity exists in plants producing glycerine from propylene to meet all requirements. There is some possibility of a new source entering the field in 1961. Increased availability of crude glycerine from foreign sources is also being predicted for 1961.

Pentaerythritol

Technology during 1960 resulted in the development of a technique for producing PE- isophthalic alkyds modified with tall or soybean oils. Mono - pentaerythritol appears to be the preferred type of PE for use in these PE- isophthalic alkyds. Other areas where pentaerythritol has shown considerable growth are in alkyds for exterior masonry surfaces, long oil alkyds for exterior house paints, emulsifiable alkyds in flat wall paints in conjunction with styrene-butadiene PVAc, and acrylic latices.

In nitrocellulose and amino-type finishes, PE-glycol and PE-glycerine alkyds showed continued growth as modifiers.

Rosin

Gum rosin supplies are expected to remain tight for the duration of 1961. This uncertain situation regarding gum rosin was aired at the annual Naval Stores Breakfast of the NPVLA's annual meeting held in Chicago last fall.

According to H. L. Meyer of Chematar Pine Products, one of the big reasons behind the current shortage of gum rosin is the increase in the free world production of paper and paper products, the largest outlet for rosin and the greatly reduced shipments of Chinese rosin to the West. Chinese rosin accounted for only about 2% of the West's supply during 1960. Another factor contributing to the tight situation has been the building of inventories by consumers since the Commodity Credit Corp. would no longer carry stocks for them.

Mr. Meyer predicted that the U. S. output of gum rosin for 1960 will increase some 5% over 1959 and yield 350,000 drums. Production of wood rosin in 1960 would be maintained at 1.2 million drums and tall oil rosin should reach 440,000 drums compared for the season that ended March 31, 1960. This total rosin capacity will total about 2 million drums, a capacity which is expected to be equalled next season.

Meyer further predicts that consumption of rosin may suffer if gum rosin prices stay at their current level of $16.50-$17.00 per 100 pounds. Rosin consumers, particularly paper size makers and paper mills, will undoubtedly try to restrict and economize rosin use. Also, it is very doubtful if foreign production will increase substantially next season.

However, Meyer closed on a happy note by reporting that the market seems to be stabilizing a bit since forward commitments seem to be covered and very modest working inventories of rosin seems to have been established. The moderation in the pricing of wood rosin during the fourth quarter of 1960 seems to have reflected on gum rosin. This has given rise to the hope that 1961 might see a more reasonable price level of this important commodity.

The U. S. Department of Agriculture forecasts that the production of gum rosin, steam distilled rosin, and tall oil rosin will rise 10%, 2% and 15% respectively in 1961.

DRYING OILS AND DERIVATIVES

Linseed Oil

The U.S.D.A. October 1 crop estimate indicated a flax crop of 30,588,000 bushels, and a soybean crop of 561,900,000 bushels. Both of these figures represent an upturn in estimate, and in the case of flaxseed, a rather sharp and gratifying increase since hot, dry weather in late July and early August had caused some anxiety in the heavy flax areas of North Dakota. From the standpoint of domestic consumption of linseed oil, the flax crop is sufficient to satisfy domestic oil needs. However at the time of this writing we find U. S. flaxseed to be the cheapest flaxseed in the world market, and consequently is attracting the interest of exporters. Uniquely Canadian flaxseed prices have been higher than U. S. prices, anywhere from 15c to as high as 25c per bushel premium over U. S. flax. The trade anticipates that Canadian flaxseed must become competitive with that of U. S. origin in order for the Canadians to sell their crop. Until that comes about, U. S. flax continues to attract world attention.

For a change this crop year, the government support price of flaxseed has not yet been a factor. The support price is set at $2.69 per bushel f.o.b. Minneapolis and flax has traded generally in the $2.80-$3.00 range. The future price level of flaxseed and resultant linseed oil will be influenced predominantly by the status of U. S. flaxseed in the world market. If our flax continues to be the most attractively priced, the exporters will look to our markets, and their interest should maintain strength in flaxseed prices. On the contrary, if Canada becomes a competitive seller, our markets will be influenced by normal supply-demand factors, i.e. consumption demand for linseed oil and linseed meal versus the then availability of flaxseed.

Soybean Oil

Turning our attention to soybeans we see another good crop. At 562 million bushels this will be the second largest crop on record and represents a continuation of sizeable consecutive soybean harvests. While soybeans have seen a spectacular production growth in the past 15 years, total production has levelled off during the past three years. Despite this leveling, the consumption trends on oil and meal have continued on the incline, and soybean production must again find ways and means of increasing.

The U.S.D.A. estimates a carry-

over of approximately 30 million bushels and this added to their crop estimate provides a supply picture of about 590 million bushels. In 1958-59 we exported approximately 110 million bushels of soybeans. This year (1959-60) exports will be increased to approximately 140 million bushels, and next crop year (1960-1961) we should maintain about the same export tonnage of 140 million bushels. We anticipate reduced exports of soybean meal from last year for two reasons—first, because of increased export of soybeans, and second, the serious drought in Europe last year placed added emphasis on imported protein. Meal prices are slightly decreased from a year ago, and this reflects favorably on feeding ratios. While animal numbers are estimated to be somewhat less in the next six months than the corresponding period a year ago, the more favorably priced meal will probably maintain the size of total crush near last year's level.

Looming in increased volume is the anticipated increase in exports of edible oil under Public Law 480. While we expect increases under this legislation, there could be some decreases in free dollar purchases of edible oil with the net result of increased exportation over last year. Summing up total anticipated demand for oil, meal and soybean exports versus available soybean supply, we see a fairly even balance for the year ahead.

As of this writing there is every appearance that soybean oil will carry more of the load of the cost of soybeans and their processing than was the case last year.

Tall Oil

Tall oil usage by the protective coatings industry has kept pace with the dynamic growth of the tall oil industry. Production of tall oil fatty acids and tall oil rosin has grown from under 10,000,000 lbs. each in 1950 to 150,000,000 lbs. of tall oil fatty acids and 200,000,000 lbs. of tall oil rosin in 1959. During 1959 the industry fractionating capacity stood at 764 million pounds. However in 1961 the fractionating capacity will have increased to 1 billion pounds. This will make available greater amounts of upgraded tall oil products as more crude tall oil is diverted to fractionation.

Of the two principal coproducts, the tall oil fatty acids have undergone the most extensive improvements to meet the varying quality and economic requirements of the coatings industry. Depending on quality, tall oil fatty acids have a fairly wide range of price, ranging from 5c per pound to 8c per pound, F.O.B. plant in tankcars. Products have been developed up to a purity of 99% fatty acid and a color of 1-2 Gardner. The lighter, purer fatty acids are finding increasing usage in high quality baking finishes, whereas the lower priced 5c fatty acids now offer price and quality incentive as well as the flexibility of working with a fatty acid when considered in competition with soybean oil. In 1959, almost 30% of the domestic tall oil fatty acid sales went to the coatings industry.

Tall oil rosin, the other principal coproduct of tall oil fractionation today represents over 20% of the rosin available in all forms, gum, wood or tall. Production of tall oil rosin has been growing rapidly and is expected to represent 1/3 of the total rosin available in 1965. Tall oil rosin therefore has been and will be very vital to the critically short rosin market. Although a smaller percentage of tall oil rosin production (as compared to tall oil fatty acids) is sold to the protective coatings industry since many producers are captively using it in paper size and rosin derivative manufacture, it represents a more significant proportion of the coatings industry's total rosin usage, successfully replacing and, in many instances, proving superior to the more critically short gum rosin.

With the acute shortage of rosin of all forms, greater interest is being displayed for high rosin content distilled and acid refined tall oil. Many formulations in which fatty acids as well as rosin are essential parts, others where some fatty acids can be tolerated, are being revised to utilize lower priced high rosin content distilled and acid refined tall oil.

With the expanded fractionating capacity available in 1961, a plentiful supply of tall oil fatty acids, distilled tall oil, and acid refined tall oil is assured. Availability and attractive low prices should help assure a further increase in consumption by the protective coatings industry.

Castor Oil

A substantial increase in Brazil castor seed crop will assure ample quantities of castor oil at an attractive price during the months ahead.

Castor oil and its derivatives have found increasing use in many coatings application. Among these is a two-can urethane coating for coating concrete. This coating is said to have high resistance to abrasion and strong adhesion, making it ideal in areas exposed to heavy traffic. Other developments include the use of dehydrated castor oil for improving the adhesion of emulsion paints; and DCO as a modifier for acrylated alkyds.

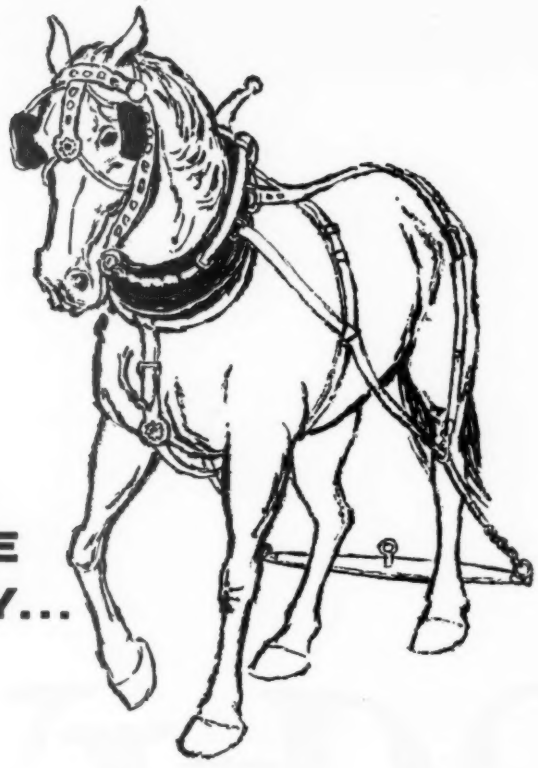
New Developments

Progress in the search for linseed emulsion paints was recently reported by the USDA's utilization research laboratory in Peoria. The paints were prepared to test emulsions of linseed oil and water; but during the evaluation of the emulsion, it was observed that many of the test paints have desirable characteristics of both resin-emulsion and conventional, linseed-oil exterior paints.

The test paints resist running water within 15 minutes after they are applied, and they surface dry sufficiently to permit repainting within a half hour. In addition the laboratory-test paints can be washed from brushes and rollers with water. Other features of these paints include good adhesion to chalky surfaces, good hiding, good flow and do not show lap marks when applied.

Some of the test paints that contain zinc oxide have remained stable on the shelf for more than 46 weeks. However, in the beginning zinc oxide created a problem. It tends to make the oil-in-water emulsion unstable.

The test paints are oil/water emulsions; like milk, they can be diluted with water. They pour and spread easily. Zinc oxide tends to invert them to water/oil emulsions; like butter, these cannot be diluted with water. But through the development of new



STILL THE WORK HORSE OF THE INDUSTRY...

RCI BECKOSOLS

Because of their versatility, proven performance, economy and widespread acceptance, alkyds continue to be the work horse resins of the paint industry . . . despite increased talk of more glamorous and more expensive resins! Reichhold is the largest manufacturer of alkyd vehicles. In addition, RCI supplies a wide range of short, medium and long oil alkyds as well as modified types.

There's an RCI BECKOSOL to meet your specific needs. The following are representative of some of the 68 BECKOSOL alkyds currently available from RCI:

In traffic paint formulations . . . RCI BECKOSOLS P-650 and P-750 (medium oil alkyds).

For interior architectural enamels and exterior trim paint formulations . . . RCI BECKOSOLS P-470 and P-296 (long oil alkyds).

For baked enamel finishes . . . RCI BECKOSOL 1307 (a short oil alkyd).

For nitrocellulose finishes . . . RCI BECKOSOLS 1323 and P-222 (plasticizing vehicles).

For metal primer formulations . . . RCI BECKOSOLS 1303 and 1341 (modified alkyds).

For air-dry maintenance and industrial finishes . . . RCI BECKOSOLS 1331, P-323 and P-531 (medium oil alkyds).

RCI is constantly developing newer alkyd vehicles to meet specialized applications. An outline of your requirements will receive prompt attention.

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specialized emulsifiers, it was possible to produce paints that have remained stable. H. M. Teeter, project leader, points out that Peoria chemists are seeking emulsion that will remain stable in paints for an ideal of four years.

In this connection, good emulsifiable safflower oils have been developed for formulating into exterior architectural paints.

Greater interest has been noted in the use of fatty acids and segregated fatty acids and to some extent in safflower oil which is essentially 76 to 80% linoleic glyceride with 0% linolenic glyceride, the latter being the yellowing factor found in linseed oil.

SYNTHETIC RESINS

Acrylics

Acrylic resin solutions and acrylic latices will be in good supply during the coming year as total capacity of acrylic esters by the four producers (Celanese, Dow Badische, Rohm and Haas and Union Carbide) will reach some 75 million pounds, exceeding present demands.

One of the interesting recent trends in the acrylic resin field has been the acceptance of thermosetting acrylic resin solutions. Perhaps the earliest thermosetting acrylic resin solutions was Acryloid AT-50 (Rohm & Haas), a thermosetting acrylic polymer which cures at 300°F. in about 30 minutes. It gives hard, glossy films with excellent resistance to soap, detergents and staining.

Within the last few months a lower cost modification has been introduced designated Acryloid AT-51. This is similar to the earlier AT-50 and is used in baking coatings on air conditioning equipment, refrigerators and on metal parts. The polymers are compatible with a number of different film formers such as epoxy resins, silicone resins, several of the vinyl resins and nitrocellulose. This has made possible the production of thermosetting coatings from a variety of film forming ingredients.

In this automotive lacquer field, 1960 saw the introduction of Acryloid A-21 LV. This is a low viscosity modification of the earlier Acryloid A-21. Automotive lacquers made with Acryloid A-21 and Acryloid A-21 LV have excellent gloss and color retention. It is not necessary to provide special primers for these new acrylic ester solution coatings since they have excellent adhesion. The resins give easy pigment dispersion, excellent resistance to staining by road tar and very good gasoline resistance. The finishes must be polished for full gloss. Acryloid A-21 LV is compatible with nitrocellulose thus making possible nitrocellulose modified refinish enamels. It also eliminated problems with interchanging acrylic finishes and nitrocellulose finishes in the same spray equipment.

A growing field which is being followed very closely by industrial finish manufacturers is the use of aluminum as a siding material. This is finished with a baked enamel and excellent forming and durability properties are required in a coating suitable for this purpose. It is expected that the acrylic finishes will continue to take a larger portion of this market in the future.

An important development in the acrylic field was Pittsburgh Plate Glass' announcement last September that it had signed licensing agreements with six foreign firms to make and sell its line of acrylic resins. Both thermosetting and thermoplastic materials were involved in the agreement.

Estimates are that present demands for thermosetting acrylics is about 5 million pounds each year. The biggest use of thermosetting acrylics is for strip coatings on steel and aluminum. Appliances, air conditioners and can coatings consume a good share of this resin. By 1965 demand for thermosetting acrylic paint is expected to reach 10 million a year, requiring 25 million pounds of resin.

A new development in this field, has been the introduction of a styrene/acrylate copolymer resin by Goodyear at the recent Paint Show in Chicago. Known as "Pliolite" AC, this copolymer is soluble in low-cost solvents—a feature which is claimed to offer distinct economic advantages over straight acrylics. It dries rapidly to form tough, hard films which adhere well to a variety of substrates with outstanding resistance to chemicals, sunlight and water. Wide compatibility with other film formers is reported for this styrene/acrylate copolymer.

Alkyds

Due to the current shortage of phthalic anhydride, manufacturers of alkyds are walking a tight rope these days in trying to meet their customers' needs. In order to cope with this situation, many vehicle manufacturers have dropped or curtailed the production of low profit lines. On the other hand, research has been stepped up, particularly in the use of isophthalic acid.

When isophthalic alkyds are properly formulated and cooked, they have three claimed advantages. Abrasion resistance, impact resistance and speed of dry.

Those who have used isophthalic acid in place of phthalic anhydride in alkyd cooks find that the viscosity builds up much more rapidly than orthophthalic. Also, it is necessary to vary the polyol content or use chain stoppers to prevent gelation. Some have found that isophthalic acid alkyds require more polyol than ortho alkyd to achieve similar acid numbers. This may vary from 5 to 20 percent of the total polyol depending on oil length.

The use of fatty acid or oil with isophthalic acid offers no problem, except when oil length is increased in which case air drying and baking schedules as well as hardness may be adversely affected.

In plant production, the fusion cooking has been the satisfactory method for processing iso-alkyds.

The Naval Stores Research Station of USDA, Olustee Florida, reported on the development of a non-phthalic alkyd type vehicle using fumaric acid and maleic anhydride and pine oleoresin. These vehicles may find use in trim enamels, concrete maintenance paints, and as a fortifier for linseed oil exterior paints. Clear films formed from these resins are characterized by good hardness, flexibility, adhesion, toughness, gloss, and color retention. The shorter oil length resins exhibit these properties to the greatest extent.

Epoxies

Epoxy resins continue to show a healthy growth in the coatings

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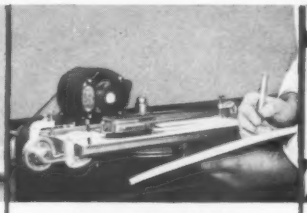

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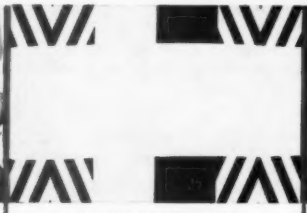
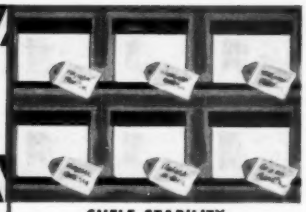
Pigment binding power plus W-617's water resistance feature makes possible paint films that develop optimum scrub resistance rapidly, giving you a really quick drying and very hard wearing paint film.



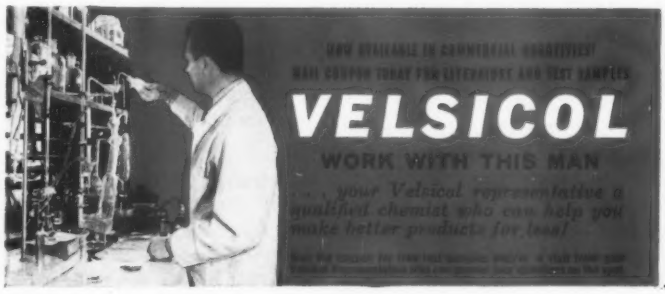
TOP HIDING POWER

W-617's high critical pigment volume concentration produces durable films with low specular gloss. Its low angle sheen gives maximum coverage and hiding of under surface imperfections.



SHELF STABILITY

Continuing tests, after 18 months showed that Velsicol W-617 as the sole vehicle or, used with polyvinyl acetate, styrene butadiene or acrylic latexes have good stability properties under standard storage conditions and under the Federal freeze/thaw specifications.



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industry. To meet increased demands, the important epoxy resin producers are integrating their processes further back to assure closer controls of raw materials and better overall economy. One company, Ciba Products Corporation, for instance, in 1960 completed facilities for making epichlorohydrin for its line of epoxies.

The epoxy industry as a whole has been keeping pace with increased demands by enlarging facilities and outputs of existing plants. As a result, formulators can be assured of continuing prompt deliveries of all epoxy types.

One reason for the bright market outlook for epoxies has been the rapid technological progress in products as well as application techniques. Most suppliers now sell a complete range of resins with high and low molecular weight and a wide choice of viscosities. New curing agents are now available which permit lower temperature and shorter bake schedules as well as better overall performance. Other curing agents are on the market that cure in a few minutes or even seconds—some designed for traffic paints and special coating where time is critically important.

Equipment to handle these materials naturally lags somewhat behind the products themselves, but two-component metering and spray equipment is now available to handle even the fastest epoxy systems.

One of the most important development projects involving epoxy coatings is in the application of 100 per cent solids coatings. The economies of such systems, particularly in product finishing, are obvious. One coat systems of substantial thickness can be applied in one operation. One approach to this goal is fluidized-bed coating in which the object to be coated is preheated then dipped into finely divided solid resin. A steady stream of air through the resin bed assures integrity of the film.

Another approach to solventless systems is by the use of special curing agents which reduce the viscosity of liquid resins sufficiently to permit application with conventional spray equipment.

New epoxy resins are on the market with built-in flexibility. These resins have a tough, rubbery quality and can be used in any proportion with conventional epoxies. Possible coating end uses for flexible epoxies include: metal and concrete pipe linings, masonry coatings, can and drum linings and many others.

As development and research programs of basic suppliers and formulators continue to improve existing products and also to create new ones, the market situation for epoxies is bound to show greater growth than it has shown in the past. Architectural uses for epoxy coatings look promising for both new construction and also for maintenance and rehabilitation. Automotive uses are on the upswing with more and more cars primed with epoxies to assure adhesion of acrylic topcoats. The appliance industries are also taking advantage of the unique epoxy properties in similar systems for washing machines, refrigerators and others.

Anti-corrosive paints based on epoxy resins for oil and chemical pipe lines are well established and continue to replace coatings of lower efficiency. An in other areas such as can and tank coatings epoxy resins are also proving their many merits.

Continuing progress of epoxy resins as an important paint raw material depends on several factors. Most important is closer controls of the entire resin manufacturing process, from raw materials to finished resins. Product development along practical lines to meet mass production and specific application requirements is another consideration for further growth. And active market-oriented technical service programs must continue to aid formulators in exploiting the potentials of these high performance resins. With these factors uppermost, the epoxy resin-based coatings market will rise to even greater heights in 1961.

In the way of new developments, Food Machinery and Chemical unveiled last year a straight-chain aliphatic epoxy resins which differs from conventional epoxies in structure, reactivity, and end properties. The new resins is an epoxidized polyolefin. According to FMC, the most striking feature of these new epoxy resins is the reactive double bonds, which permit cures with peroxides catalysts. This is not possible with other epoxies currently available. FMC claims they can pinpoint the unsaturation both internally in the carbon chain which is the backbone of the molecule, and externally in the side chains, it also can control the number of double bonds present. Because of this molecular structure, a wide range of curing agents and reactive diluents can be used. Moreover, graft polymerization with vinyl monomer is also possible with these particular epoxies.

Last summer Union Carbide announced the commercial availability of a new family of epoxides (Unox) having cyclo-aliphatic structure. Surface coatings application

Using an epoxy coating, a painter touches up seams in this concrete hangar floor. The system cures to a tough, durable, high gloss finish in 8-10 hours.

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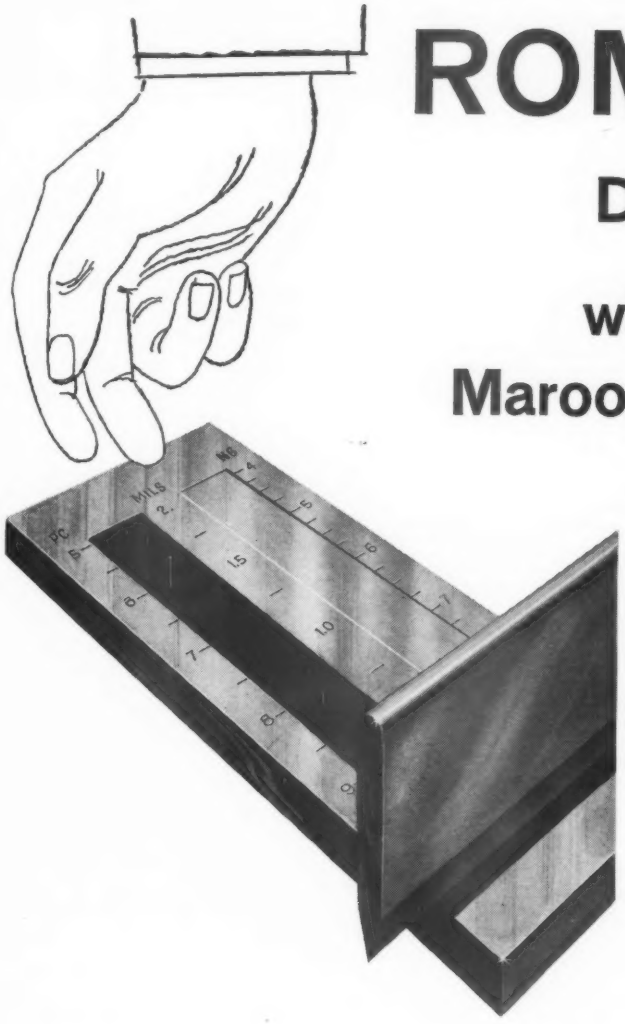

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for these new epoxides include marine spar varnish, linoleum finishing varnish and wall tile for both interior and exterior use.

A more recent UCC development with these new epoxides is a baking-type epoxy coating system based on Unox 201 and dimer acid Empol 1022 (Emery Industries) has been recognized as having potential as an epoxy resin hardener. By taking advantage of the fast acid reactivity of Unox 201 and with the discovery of stannous octoate as a powerful acid-epoxide catalyst, quality industrial finishes can be formulated. Properties of such finishes include good appearance and depth of gloss, high water and humidity resistance, good caustic resistance, good resistance to yellowing and chalking on exterior exposure; one coat on steel shows good adhesion (requiring no primer); high solids content—80%; it can be into formulated cold mix (no cooking necessary); and cost is equivalent to short oil alkyds.

A most interesting epoxy development during recent months was anhydride-cured epoxy coatings by Du Pont's Explosive Department. PMDA (pyromellitic dianhydride) can be adapted to use in epoxy coatings, by reacting it with glycols under controlled conditions to form novel dianhydrides which are soluble in common organic solvents. Coating formulations containing conventional solid epoxy resins and PMDA -glycol adducts were developed which attained an excellent balance of physical properties and solvent resistance after a relatively mild cure of 15 to 30 minutes at 300 deg. F. The resistance of the coating to attack by mineral acid, glacial acetic acid, and boiling water was exceptionally good. The shelf life of the formulations was greater than sixty days. The glycol used for most of this work was Dow Resin X-2635. When a polypropylene glycol was used as the glycol component, the cured coating possessed flexibility sufficient to withstand post-forming operations on the steel substrate. Three liquid polyfunctional epoxy resins could be cured with PMDA-glycol adducts at room temperature in 7 days or less to produce coatings with excellent physical properties and MEK resistance.

Union Carbide Plastics announced at the Paint Show in Chicago a practical method for producing a range of epoxy resin esters. Using only their liquid epoxy resin ERL-2774, bisphenol A and any chosen drying oil fatty acid, resins of any desired chain length may be prepared and esterified either completely or to any selected degree. Advantages of this technique are wider latitude in formulation, the preparation of esters from resins of much greater chain length, and a possible reduction in raw material costs.

A low molecular weight polystyrene resin (Piccolastic A-5) is recommended as a modifier for epoxy resins. Marketed by Pennsylvania Industrial Chemical, this polystyrene resin is compatible with most commercial epoxy resins, especially those of the bisphenol A type. Compatibility is dependent on the epoxy equivalency of the epoxy resin. According to PICCO, A-5 changes many aspects of epoxy resin compounding. These include the extension of pot life of epoxy compounds; the amine hardener can be packaged indefinitely in the A-5 which facilitates the addition of both materials to the epoxy component; as an inert diluent, A-5 causes some reduction in tensile strength, impact resistance and chemical resistance; and as a low-cost modifier it can greatly reduce the high cost of using straight epoxy resins.

Isocyanates and Polyurethanes

John Hull, product manager, Isocyanates for Allied Chemical's National Aniline Division, estimates that the total U. S. industry capacity for isocyanates exceeds 100 million pounds a year. This figure includes Mobay's recent expansion to 40 million pounds per year and National Aniline's plans to triple its isocyanates capacity during 1961. This industry capacity, maintains Mr. Hull, is more than adequate to serve all markets for urethanes. In spite of a slight general business recession during 1961, he believes that the market for urethane coatings will become widely commercial by the end of 1961, or possibly early in 1962.

The development of urethane coatings for marine uses, floors, and exterior wood surfaces will do much to push the urethane coating market to new high levels. Oil-modified urethane coatings, which require no mixing of components prior to application and which can be applied like any ordinary paint, are growing in popularity.

It has been said that the cost of urethane coatings, which runs some 30 to 40 per cent above those for other types of finishes, is a drawback to their market development. However, when the buying public and industry realize that the long wearing properties of urethane coatings will give significant savings—mostly in the labor for application—price will be no problem.

According to Earl B. Smith, Jr., manager of Special Products Sales Dept. of Spencer Kellogg, 1960 has seen the beginning of broad marketing of urethanes for surface coatings. The seed was sown in 1957 by virtue of introduction of practical polyurethanes for protective coatings,—germinated in 1958 by broad and varied testing programs,—started to grow in 1959 from testing programs proving the value and versatility of the unique commercial urethane systems, and started to branch in 1960. 1961 and forward will show rapid growth of the market for urethane coating systems; particularly in the one-can stable systems. Many paint and specialty coating manufacturers have initiated broad promotional programs and many more are scheduled for introduction in 1961.

Urethane coatings vehicles will be in plentiful supply. Urethane foams account for most of the consumption of the chemical isocyanate (raw material), and the supply and market of foams in themselves is expected to broaden substantially. Urethane coatings resins will benefit accordingly in price, supply and quality. As a result of the already expanding market, raw material costs of urethane coating resins have already declined in 1960. Urethane resins are becoming more practical and competitive in the branches of surface coatings to which they apply.

The market for urethane coatings is established within well defined segments. It is believed that more than 75%s of the urethane vehicle

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market encompasses the oil-modified or so-called one-can stable urethane vehicle. This type is the one which can be used by industrial and trade sales consumers alike. It is the practical one. This type is not sensitive to moisture and may be easily pigmented. It is further estimated that more than 85% of this consumption is accountable to marine finishes, clear exterior architectural finishes, and floor finishes. Exterior (marine and architectural) applications are being expanded as a result of superior durability over conventional clear exterior finishes. Wear and water resistance properties are proving desirable for floor finishes. The balance of consumption in both oil-modified and in prepolymer systems is spread across an area of specialized high-service industrial finishes utilizing the high degree of water, chemical and wear resistance of the urethane vehicle. Corrosion inhibiting systems are in the formative stages, showing promise as pigmentation problems are explored and overcome.

Technological developments during 1960 have been particularly important in the formative stages of this market. Pigmentation techniques for the prepolymer systems have been rendered practical for the paint manufacturer, which will benefit the high-service chemical coatings aspect of the urethane market. In other words, all urethane prepolymer systems are sensitive to hydroxyl bearing components, including water and atmospheric moisture. A "slurry grind" technique developed by Spencer Kellogg Laboratories has been proven practical and effective to eliminte these reactive components in a pigmented system. Hence, stable primers and enamels can now be made from the prepolymer systems. New moisture-curing prepolymers now enable the formulator to develop one-can systems (that do not require a separate catalyst addition prior to use) in clears or pigmented finishes. These finishes then afford full commercial advantage from the high degree of water, chemical and wear resistance of urethane prepolymers. It is expected that these two developments ("slurry grind" pigmentation and new fast-drying moisture-curing prepolymers) will enhance marketing of industrial urethane finishes for industrial product, industrial maintenance and corrosion-inhibitive systems.

Also, new developments in fast-drying oil-modified systems will broaden the industrial market for one-can stable systems themselves. New products in the quick-drying area will open up markets for industrial clear finishes for wood products; such as flooring, paneling, cabinetry, and the general area of prefinished construction materials.

The general trend in our industrial economy, including the prefabrication of construction materials, is toward faster cure, faster cure and faster cure. Now that faster curing urethanes are available in both the oil-modified and in the prepolymer systems, the market will broaden. Now that the high performing (in chemical, water and wear resistance) prepolymers may be pigmented, decorative applications will broaden also.

Much is to be learned about the versatile urethane resins, but much progress has been made in learning and adapting these complex vehicles to commercial use. The market will broaden substantially and will afford the formulator a multi-purpose tool for specialized high-service finishing systems.

Polyesters

A new group of high-molecular-weight, linear polyester solution resins was introduced at the recent Paint Show in Chicago. Manufactured by Goodyear's Chemical Division, these polyester resins have been assigned the family name Vitel. Goodyear claims that coatings based on these new materials combine outstanding resistance to abrasion and ultraviolet light with excellent adhesion, clarity, hardness and electrical properties. Solutions of these polyester resins produce continuous, glossy, non-tacky films. Application may be accomplished through brushing, dipping, spraying, knife and roller-coating. Areas of application include coatings for metal, wood, plastic, paper, leather and textiles.

Chlorinated Polypropylene

Parlon P, offered by Hercules Powder, is a new film-forming resin made by chlorinating polypropylene. Evaluation work by Hercules indicate that in coatings, Parlon P can be expected to contribute hardness, abrasion resistance, and film integrity, plus resistance to alkalies, acids, salt spray, other corrosive agents, moisture, mold growth, heat and sunlight deterioration. Recommended applications for Parlon P are in paints applied to alkaline surfaces such as concrete, stucco, and asbestos-cement products. Its good solution color and film clarity indicate utility in overprint varnishes and vehicles where clear whites and pastels are desired. This resin is soluble in toluene, xylene, and other aromatic hydrocarbons; in esters and ketones and in chlorinated solvents. It is not soluble in alcohols or aliphatic hydrocarbons. It is compatible with some plasticizers and other film formers.

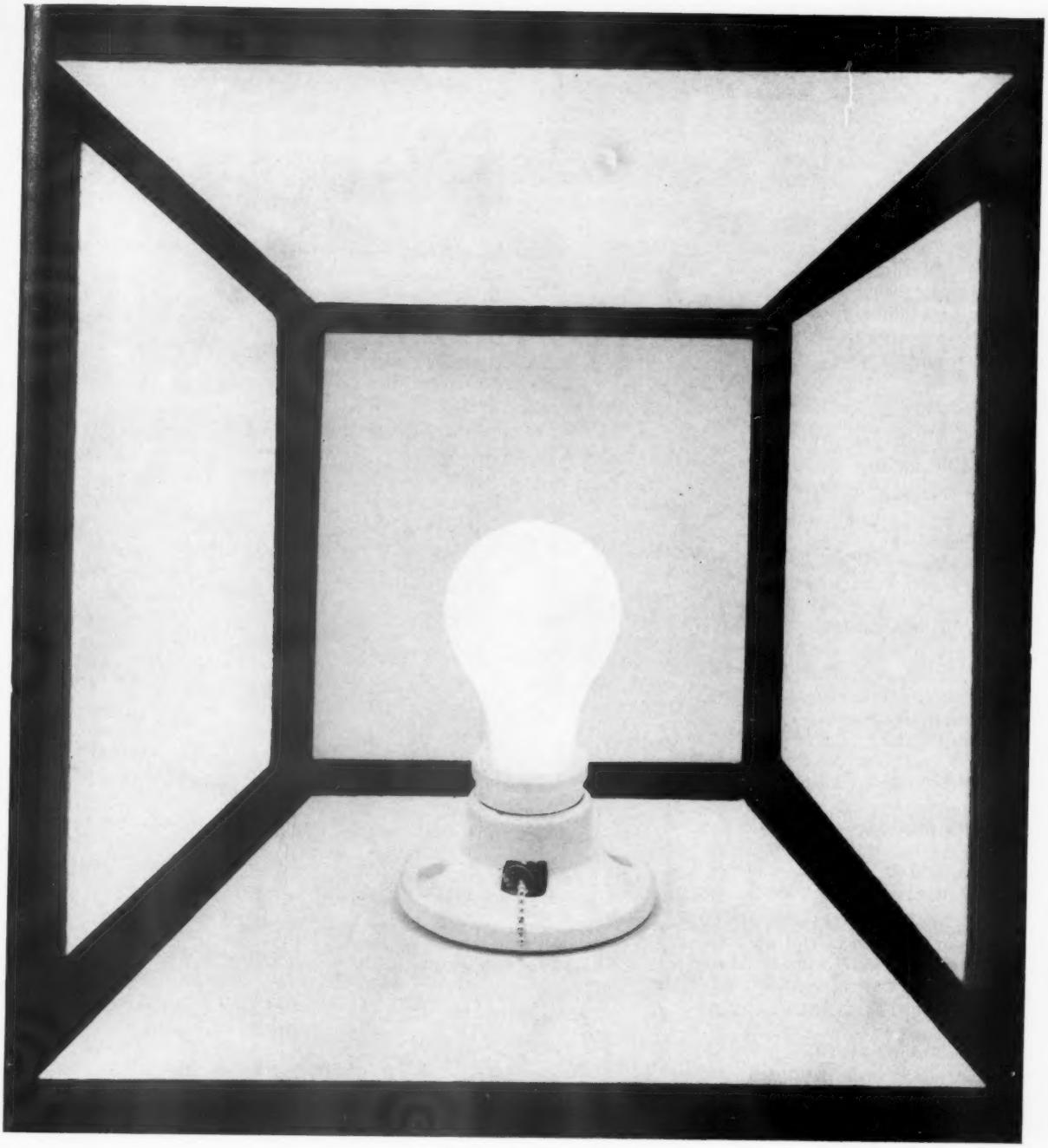
Thixotropic Vehicles

Usage of thixotropic vehicles as modifiers to obtain whatever degree of thixotropy a paint formulator may desire almost doubled throughout the world in 1960.

In their original concept thixotropic vehicles (Burnok) had application primarily in trade sale paints and were considered miscible only with aliphatic solvents. Today, these vehicles are being used extensively in industrial applications and through continuing research are now available in aromatic solvents.

Thixotropic vehicles are becoming a prime factor, in combination with linseed oil and basic lead silico chromate, in combatting steel corrosion as well as in substantially lowering application costs. With conventional paints, it takes at least four coats on steel to obtain an adequate five-mil protective thickness. Thixotropic modification enables 6-8 mils of protection with only two coats of paint. From the standpoint of application costs, thixotropic modification enable a cost reduction of some 54%. Furthermore, with many of the presently used coatings it takes two weeks of drying time before re-coating. Thixotropic modification enables a through-dry that takes but two days prior to re-coating.

Other new and expanding fields for Burnok are in traffic paints for



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obtaining thicker coatings for longer wear, in multi-color latex systems to maintain the metallic fleck in indefinite suspension, and as a modifier for pigmented petroleum resins to eliminate settling in concrete curing compounds and yet provide controlled flow and leveling.

Hydrocarbon Resins

During 1961, hydrocarbon resins will continue their usage growth in the coatings industry. This is the projected view for the coming year. To assess the validity of this optimistic position, at a time when many published economic indicators show traces of uncertainty, the premises on which this position is based can be evaluated as follows.

The supply situation for these resinous products is and will continue to be favorable. Productive capacity, based on both new and in many cases improved manufacturing facilities, provides complete accurance that this class of resins will be available to meet the needs of the coatings industry in the year to come. As an ancillary provision, advances in technology have resulted in improved color characteristics and of continuous rigid uniformity.

Few resinous products can show the degree of stability and price structure that is distinctive for hydrocarbon resins.

New applications have been developed which will extend the area of utilization of hydrocarbon resins in protective and decorative coatings. Typical examples of the new use developments for the coatings industry are: (1) Use of hydrocarbon resins with alkyd vehicles; (2) Multi-color paint formulations; (3) Traffic Marking paints; (4) A fluorescent paint using a hydrocarbon resin emulsion as the vehicle; (5) Increasing use of hydrocarbon resin emulsions as vehicles for interior flat paints.

In combination with long oil alkyds, hydrocarbon resin modification provides improved water and alkali resistance which is said to compare to the use of rosin esters in a similar application. In addition, air dry rates also show improvement.

In the application of traffic marking paints, hydrocarbon resins can be used in special formulations with vinyl toluene butadiene copolymer resins and with chlorinated rubber —alkyd vehicles. The desired degree of film toughness and drying rate requirements are met by this type of modification. Savings in raw material costs are thereby available to the coating formulator.

The compatibility of specific light colored thermoplastic hydrocarbon resins with styrene-butadiene or vinyl toluene-butadiene and polystyrene resins makes possible the formulation of one package multi-color paint systems that have the package stability, low odor and wide range of decorative possibilities that are necessary.

The expanding use of fluorescent coatings, particularly in the field of display card, poster and inks indicates the desirability of a low cost vehicle preferably of the water thinnable type that can maintain the fluorescence of the pigment. Laboratory work with selected hydrocarbon resin emulsions show promise in this particular application.

Buton Resins

Continued development of now commercially available Buton Resins (Enjay Chemical Co.) has revealed unusual adaptability to high speed or "instant cure." Direct flame impingement, flame spraying, high energy infrared have all been used to cure thin films (up to ¾ mil) in less than 10 seconds. Resulting finishes are tough, adhesive, and resistant to many chemicals and corrosion.

Other available data demonstrating film quality or economy advantages favor Buton resins in blends with nitrocellulose, vinyls, ureas, alkyds, acrylics, and other resins for air-drying or general baking schedules. In addition, straight Buton films are claimed to have outstanding chemical and corrosion resistance for primer and finish coats.

WATER THINNED RESINS

Architectural Paints

Estimates are that latex paint sales for 1960 will hit close to 80 million gallons. The bulk of this volume was used on interior and exterior masonry surfaces. Not satisfied with lion's share of the interior paint sales, latex paint manufacturers kept a watchful eye on the exterior wood market—an area which consumes some 50 million gallons of paint each year.

To fatten their sales, several manufacturers plunged into this market with the result that some two million gallons of latex paints were sold for exterior wood application alone.

Consumer reaction to this new concept in house paints was most favorable because of the remarkable performance qualities of these paints plus their easy-application and clean-up features. However, latex paints for exterior wood application have two serious drawbacks—(1) poor adhesion to bare wood and (2) poor adhesion over chalky old paint films.

To circumvent these problems, manufacturers recommend the use of an oil primer on bare wood and chalky surfaces.

On the other side of the ledger, latex exterior paints have some striking advantages over oil-base systems. These include superior chalking qualities; a film life expectancy of 50 percent greater than conventional exterior oil paints, and better color retention.

In analyzing the latex paint market, N. R. Peterson, Manager Coatings Technical Service of Dow Chemical points out that Dow expects to produce and sell more latex—and more latexes—for a greater variety of uses in 1961 than in any previous year.

"Last year our latex production facilities expanded to the East Coast and saw us then provide local service in latex to the four quarters of this country.

This year we've stepped across the Atlantic into the Netherlands where we are setting up our first European latex production plant. Such expansion is calculated to keep our production at levels adequate to meet customers' increased demands for product.

"We remain a producer of various latexes of many polymer types useful in the paint, paper, textile, and building product industries. We expect all of these areas to continue to increase their latex consumption but anticipate the greatest per-

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Glidden's new exterior latex paint (Spred House Paint) is applied easily and quickly and dries to touch in 20 minutes.

centage increase will occur in the building product field. This is a somewhat ominous factor as far as the paint industry is concerned because of the fact that a high percentage of the paints used by the building products industry will be made by them. I think the paint industry should seriously study the reasons why the building products industry is dashing into the factory finishing of so many of the surfaces once regarded by the paint industry as prime markets for trade sales items. An obvious factor is the high cost of applying trade sales products. The new exterior latex paints for use on wood are a step in the direction of combatting some of the factory application of finishes, but much remains to be done. For instance, there is considerable speculation whether exterior latex paints for use on wood will become major items in the paint industry until there is developed a legitimate two coat paint system. This would be made up of a universal water-thinned primer useful on any type surface and a companion topcoat. Together, these coats would do the necessary job of decorating and protecting the substrate with minimum labor requirements for application. This target is a major one with us and we are optimistic of success.

"The do-it-yourself market for paint products continues to expand and a market area that will see a number of new products in 1961 is the area of clear latex finishes for wood, launched as direct competitors to conventional varnishes. Work in progress indicates that in addition to doing an outstanding job on wall surfaces, there is considerable promise for floor finishes.

"Last year we suggested that latex paints would play a role in every paint area within the next five years. Let's amend that to read "important role." We believe the lion's share of the paint market will eventually split between latex systems and 100% solids systems—and of those two, the latex are far more versatile. A large part of our confidence in the paint area results from the drive and energy shown by paint manufacturers in evaluating, formulating and marketing

Latex binders are a single ingredient in complex paint formulations. The latex must exhibit compatibility and property development with all other ingredients. Starting point formulations are exhaustively tested in the Dow Coatings Technical Service Labs.

improved paint systems.

"One last thing—we expect the latex field to continue to be highly specialized. We expect further demand for latexes which efficiently perform a single special role, rather than a demand for latexes exhibiting broader spectra of properties. We think this trend is a result of industry's insistence on the best latex for each end use application—and we believe the trend is advantageous to the large latex producers like ourselves who can back up their latex production with an in-depth approach involving research, development and technical service.

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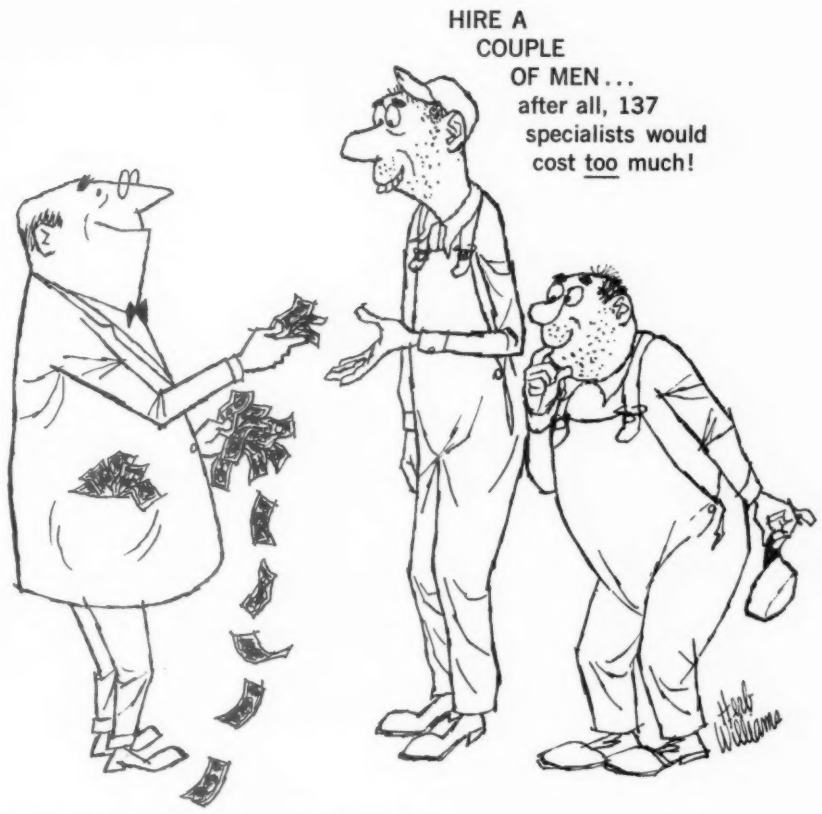
HOW TO MAKE YOUR OWN COLORANTS



Even when you hire top-notch, experienced men to make your own colorants—that's only the beginning.

Can they turn out the variety and quantity you need of each type of dispersion—without accumulating a big inventory of cats and dogs? Can they make the constant tests to assure uniform strength, Ph and color development? Can you, for that matter, provide them with the hundreds of thousands of dollars of laboratory and production equipment they need?

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Ask your Cal Ink representative for a complete booklet of these "helpful hints."

has spurred emulsion manufacturers to develop materials and formulations for the manufacture of these particular coatings to meet present-day building codes for schools and other public buildings.

Most intumescent fire retardant type paints available today are the aqueous or non-aqueous two package systems or the single package system. The two package system has the disadvantage of having to be mixed prior to use with the risk that the proportions will not always be correct. The solvent system in most cases is prepared with flammable solvents which must evaporate from the film before it can become fire retardant.

National Starch and Chemical has developed two stable, single package, interior paints which have excellent shelf stability. One type is for brush or roller application, whereas the other is designed for spraying.

Employing PVAc emulsion (Resyn 1066) National Starch says that this emulsion has the unique ability to tolerate high loadings of di- and trivalent salts which have a tendency to cause precipitation or coagulation of the latex system.

According to National Starch, these paints are very effective in protecting flammable substrates such as wood, ceiling tiles, and plastics when a spread rate of 125-175 sq. feet per gallon is applied.

Celanese recently announced a PVAc interior flat intumescent fire-retardant paint.

New Developments

New latex emulsion introduced during 1960 include: Celanese's VX-551, an acrylic tripolymer emulsion for paints and special coating applications: Darex Everflex MF by Dewey and Almy, vinyl acetate copolymer emulsion for paints for over "green" plaster and exterior masonry; an acrylic copolymer emulsion, U-7001 Ubatol, by UBS Chemical for gloss latex paints; styrene-butadiene (X-3339) by Dow for interior paints, designed to cut paint making costs by using synthetic thickener, doing away with cooking and storing portein solution, good hiding at low levels, and doesn't require large amounts of preservatives and stabilizers; and National Starch's Resyn 3600, polyvinylidene chloride as a water-based latex for application on porous and non-porous materials.

In the emulsion field one of the recent developments has been the introduction of thermosetting acrylic emulsions. Within the last few months Rhoplex AC-201 has been introduced for the production of water reduced baking enamels which are tough, flexible, hard and glossy. It is a lower cost modification of AC-200, also an aqueous emulsion of an acrylic polymer. Single coat enamels baked for 30 minutes at 350°F. on cold rolled steel give excellent flexibility over a 1/8" mandrel and will stand immersion in water for 8 hours at 165°F. with good wet adhesion and with no blistering. Over washing machine primers these aqueous films will withstand 75-80 hours immersion in hot water or detergent solution without blistering. Emulsion finishes of this type are particularly useful for the industrial finishing of composition board where the holdout of emulsion systems on permeable surfaces is needed.

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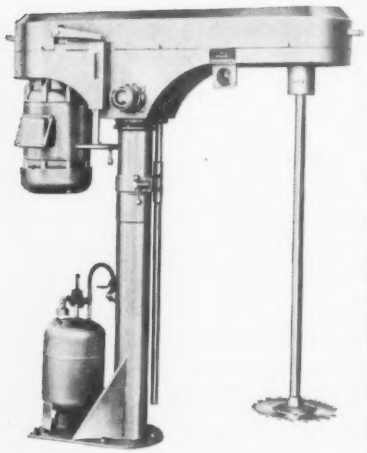

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Cab coating is applied to truck on Ford Motor Company's Twin Cities assembly line by workman using paint primers, made with Cargill's water-soluble resin. The product, fireproof and odorless, was applied to the test truck by the plant's regular spray equipment.

was unveiled by Cargill at the Paint Show last fall.

The product is designed specifically for industrial baking finishes, according to James M. Stanton, Cargill's technical services laboratory manager.

Release of the product—Cargill 750—follows two years of laboratory and in-factory tests. Stanton described one project at Ford Motor Co's Twin Cities assembly plant in which Cargill arranged to purchase a pickup truck and have it specially prime-coat-tested with the new formula and finished with Ford's conventional enamel. "We saw first-hand that 750 works well under normal production conditions and at the same time obtained a yardstick on which to measure performance for several years to come," Stanton said.

Properties of the new resin include excellent hardness, fast curing, impact resistance, water and solvent resistance, good adhesion and flexibility; good wetting at all reductions, normally difficult to achieve in water based systems; formulable into practical paints at desirable solids content; good oven baking characteristics after normal flash-off periods, unlike many water systems which require extended air-dry time to avoid oven blistering.

Cargill laboratory tests indicate 750 in an automotive paint primer performs at least as well as current epoxy resins and that it compares favorably in price. Although 750's dark color precludes its use in whites and pastels, it has wide application in high gloss, industrial top coat paints for steel drums, coated strip steel, metal toys and other similar uses.

PIGMENTS

Colors

There is expected to be no supply problems for chemical pigment colors based on present raw material supplies and the expected demand for colors.

Inorganic colors represent the largest tonnage requirements and all types should remain in good supply. Raw materials for inorganic colors appear to be in good supply. Chromite ore for chrome colors comes from Transvaal in South Africa, and is somewhat related to the general situation in vicinity of the Congo. However, most suppliers have two to three years supply of ore on hand and the government also has some stock pile so we see no supply problem. Other metals used by color industry include cadmium, copper, selenium, zinc, iron, tungsten, and molybdenum and all are in good supply.

Organic colors are not presently affected in any critical areas by supply of organic intermediates. However, the supply of phthalic anhydride, beta naphthol and other

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18

naphthalene derivatives are dependent on production of the steel industry which is presently operating at a reduced rate. There was a loss of a substantial unit producing dichlorbenzidine and dianisidine. This might affect supply of benzidine yellows, benzidine oranges and pyrazolone red during next few months. Other raw materials for organic colors are all in good supply. Phthalocyanine blues appear to have excess production available.

As for new developments there has been increased interest in brighter colors for exterior tinted paints, according to Imperial Color. This has increased interest in some new Yellows of Hansa type that show marked improvement in lightfastness. These new types are now finding further use for lead-free finishes as well as emulsion paints.

DuPont sees brisk activity in colors for 1961 and looks for expanded use of their quinacridone line which now includes a scarlet and a maroon. These additions permit production of durable coatings in colors not possible before. The Monastral reds and violet are now being used in increasing quantities for automotive finishes, wall fabrics, and floor coverings, plastic boats, outdoor signs, printing inks and many other products.

Pigment Developments

New and interesting pigment developments offered to the paint industry last year included the following:—

National Aniline's Harmon Colors new quinacridone pigment is said to possess a clean brilliant red-violet hue and can be used to produce varied color effects such as fiery red shades with molybdate orange, clean pastels with TiO_2, bright iridescent red-violet shades with non-leafing aluminum, brilliant yellow toned iridescent maroon colors with aluminum and gold paste or other yellow and orange pigments. Suggested coating application include alkyd enamels, nitrocellulose lacquers, etc.

Low Opacity Mapico Yellow and Red by Columbian Carbon are said to provide not only low opacity, but also light fastness, and ultraviolet screening. In addition they are non-toxic, acid-alkali stable and can be readily dispersed and non-bleeding.

Reichard-Coulston's 1681 iron oxide is a product designed as a double-barreled approach to cost-cutting through its exceptionally high (96%) iron oxide content plus its easy grinding characteristics.

Helio Fast Bordeaux RR Toner 39-6001 by General Dyestuff is a vat pigment which is said to have good tinctorial strength and is unsurpassed for producing rich maroon tones. This pigment is recommended for enamels, and aluminized formulations, where its excellent fastness to light and transparency makes it unequalled for automotive metallic finishes.

Kentucky Color's Pimento red is an inorganic color which is non-bleeding and possesses easy dispersion properties making for fast mixing and production rates. Kentucky also marketed a new Hansa-type organic yellow which is an improvement over standard Hansa yellow. Properties most noticeable are better fade resistance and reduced solvent sensitivity.

Harshaw is offering a new phthalo green dispersion incorporating unusual blueness, cleanliness and extra tinting strength. Designated W-6012, this green performs with typical phthalo stability and insures maximum product uniformity because it is manufactured in large size batches.

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FAFL-M based paints, used indoors or out, show excellent uniformity over various surfaces differing in porosity even in one coat applications. FAFL-M can be used with a percentage of raw or refined oils without losing body. Its low acid number makes it stable with pigments.

Coatings made with FAFL-M maintain a new, clean look throughout the service life of their films.

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SPECIFICATIONS

VISCOSITY	U-V
NON-VOLATILE	30% ± 1%
COLOR	6 Maximum
ACID NUMBER, 10 Max. (on solids)	
WEIGHT per gal.	7.3 lbs.
TYPE	Pure drying oil alkyd
Solvent	low odor

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STillwell 6-1144

A pigment for halogenated paints requiring flame resistance was introduced by National Lead. The pigment ("Oncor 23A") is composed of an inert silica core of low specific gravity and has a surface layer of antimony oxide fused to the core. National Lead claims that this pigment compares favorably with antimony oxides in flameproofing efficiencies. It may be used with polyvinyl chloride, vinyl chloride copolymers, chlorinated rubber, chlorinated paraffins, chlorosulfonated polyethylene, chlorinated polyesters and commercial fluoropolymers.

The use of molybdates as corrosion-resisting pigments was discussed by H. O. Schoen of Battelle at the 38th annual meeting of the Federation in Chicago.

Preliminary investigation shows that these pigments are generally equal or out perform red lead as corrosion-inhibitive pigments, according to Schoen. The two big advantages are non-toxicity and white color. Because of their nontoxic properties, molybdates can be used as primers for food processing machinery, food storage containers, water tanks, etc. And since they are white, these molybdate pigments could be used in one-coat paints for metal surfaces that are both corrosion resistant and decorative.

Mr. Schoen explained that the molybdates were more expensive than most common corrosion inhibitive pigments. Because of the lower density of molybdates compared to red lead, the price differential becomes small.

One of the interesting properties of these molybdate pigments is that they are neither very soluble nor very insoluble in water. This is important since in order that inhibiting pigment function well, they should have intermediate solubility. Three molybdate pigments were studied; calcium molybdate, zinc molybdate, and zinc polymolybdate.

Findings by Schoen show that as a primer alone, calcium molybdate show better all around performance than either of the zinc types, but the calcium type did not fare too well in Florida exposure. With regard to the two zinc compounds, normal zinc molybdate stand up better than polymolybdate. In covering the molybdate primers with a topcoat, the zinc compounds are superior to the calcium molybdate, with normal zinc the best.

Titanium Dioxide

The titanium pigment industry has achieved a remarkable rate of growth is attested to by the production figures which climbed from 1,800 tons in 1925 to an all-time high of 506,334 tons in 1959. Manufacturing facilities for titanium pigments have been expanded with increasing use and are sufficient to meet all the demands of the paint industry as well as those of 16 other major industries that have incorporated TiO_2 into their products. Furthermore, mineral exploration and development have disclosed ample reserves of titanium ore.

In years past, titanium pigments have been developed to a high degree of quality and uniformity. As is often the case, subsequent improvements are usually made in smaller increments. This has been the situation during the past year. Small but significant improvements have been made in the various titanium dioxide pigments. The improvements have been primarily in whiteness, brightness and ease of dispersion. Calcium base pigments which have always been

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outstanding for their hiding efficiency have also been further advanced in quality with cleaner tones and higher tinting strength.

Looking to the future, we have every reason to believe that the demand for titanium pigments will continue to grow. The paint industry is the major consumer of titanium pigments and their use in paint is constantly expanding. Customer interest in the new exterior latex paints is extremely high and reports of success have been many. Since these emulsion paints have a greater titanium pigment content than conventional oil base house paints, the expanding sales of water reduced exterior paints will step up the demand for titanium pigment. Housing surveys are currently in the area of a million per year. Thirty-five pounds of TiO_2 are required for painting inside and out on each new home of modest size. When we take into account the fact that normal repaint business is several times the new, the picture becomes more encouraging. The expanding population will naturally place greater demands on the automotive industry in the future years and with the increase in the number of automobiles on the road, many miles of new expressways and parkways will be required to accommodate the increased traffic flow. Each new American car of standard size, finished in a white or light shade, requires better than 5 lbs. of TiO_2. Each new mile of highway, marked with a 4" skip line down the middle, takes 35 lbs. of titanium pigment for the traic paint.

In the way of developments in titanium dioxide, Hilton Davis is now making available three new dispersions utilizing titanium-dioxide pigment R-900 which is a rutile pigment and is characterized by a higher whiteness.

Zinc Pigments

Total industry shipments of lead-free zinc oxides during 1960 are currently estimated at 173,000 tons, or about 3% lower than 1959. Of this quantity, the primary producers supplied an estimated 130,000 tons, the balance coming from secondary and imported sources.

Total industry shipments of leaded zinc oxides during 1960 are estimated at about 21,000 tons, or approximately 7% lower than 1959. The paint industry normally consumes virtually all the leaded zinc oxide and about 20% of the lead-free type, so its consumption of these pigments declined about 3% (lead-free) and 7% (leaded) from the 1959 figures. In view of the fact that the total production of paints in 1960 was approximately equal to that of 1959, it is evident that the decline in usage of zinc oxide pigments in paint is continuing.

The cooperative test fence exposure programs carried out by the individual zinc oxide producers, and collectively through the American Zinc Institute, have continued to show the desirability of using zinc oxides in protective coatings. The decline in usage of zinc oxides by the paint industry undoubtedly reflects the increasing percentage of the total paint market going to emulsion paints into which zinc oxides have generally not yet been introduced. Considerable work on this problem is underway at the present time by the zinc oxide industry.

While there were no outstanding new developments in the manufacture of zinc oxide pigments during 1960, most domestic producers have improved the dispersibility of

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their various grades in paint vehicles, particularly when high-speed, low-shear mixing equipment is used.

The indicated consumption of zinc oxide pigments for 1961 shows no great change from 1960 and supplies are expected to be adequate despite the long shutdown of the largest domestic producer owing to a strike.

There were no important technological developments involving lithopone or zinc sulfide and the consumption of these pigments continued substantially the same as in 1959, or a total of about 15,000 tons. These pigments are used mostly in specialties and no important change in their usage is expected during 1961.

Extenders

In recent months, suppliers of extender pigments have been giving greater emphasis to the cost-saving factors which extender pigments can contribute in various latex paint formulations, where a particular extender will produce improved hiding at low concentrations.

For example, Johns-Manville recently offered a new grade of synthetic, hydrous calcium silicate (Micro-Cel T-38) which is said to display remarkable hiding power at low concentration. According to Johns-Manville, formulators can effect savings by replacing, a portion of the TiO_2 content without loss of hiding.

Similarly, J. M. Huber with its Zeolex 82, a sodium silico-aluminate extender, which in combination with TiO_2 can produce hiding power greater than may be expected on a purely additive basis. In PVAc formulations, this new pigment is said to permit major cost reduction without sacrifice of paint properties.

Georgia Kaolin has demonstrated the use of large-particle hydrated aluminum silicates which offers the paint manufacturer a low-oil absorption flatting agent for control of gloss and sheen. Georgia Kaolin claims that by using this inexpensive type of flatting agent, more free binder is available in a given system, which is reflected as improved enamel hold-out, lower viscosity and better scrub resistance. Further, higher loadings are possible, because of the lower binder demand, with resultant reduction in cost and improvement in hiding.

Commercial manufacture of microfine precipitated silicas under the trade name "Quso," was announced by Philadelphia Quartz. This silica is used as a flatting agent for nitrocellulose lacquers. In addition to its high flatting efficiency, this silica has good suspension characteristics and resistance to overgrinding.

SOLVENTS

Petroleum Solvents

When we look back on 1960 and look forward into 1961, there is little change in the supply situation with regard to petroleum solvents. The period ahead will be one where all solvents from petroleum will be plentifully available. There are two reasons for this situation. On the supply side, many refiners are finding it attractive to attempt to market solvents in some quantity due to the very low alternate use values for other refinery products. On the other hand, the demand for petroleum solvents is not keeping pace with all the additional production. As a result of this relationship, we look forward to a plentiful supply of petroleum solvents for 1961.

There are quite a few technological developments going on in the

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field of petroleum solvents. Some of these are in the manufacture of the product and some of these developments are in the application of solvents.

On the manufacturing side, the industry is responding to customer insistence with product improvement in odor and boiling range. Much work is being done, for example, to lower the odor level of regular mineral spirits. This odor work has been successful enough in many instances to result in the replacement of the higher cost odorless mineral spirits. These improved odors are being developed in some cases by segregated crudes but more generally by improved processing techniques. Although at a sacrifice in yield, many refiners are providing lower end point mineral spirits which results in a narrower boiling fraction and better control in applications.

Another technological development is the increase in the raffinate available from aromatic extraction facilities. Products from these processes are low in aromatic content and therefore low in odor and solvency. The reduced solvency is a disadvantage at times but with certain systems, these closely controlled raffinate cuts are providing the formulators with another tool for coating work.

Technological developments are such that the paint and varnish industry is receiving better and better solvents at the old price levels. In very few instances have the many improvements been accompanied by any increase in price.

In the application of solvents, much work has been going on and many papers are being written on the fact that current specifications do not always predict a solvent's performance. It has been shown that current tests, such as Kauri Butanol value and aniline point, do not always indicate what the system's viscosity will be. Trying a solvent in the exact system where it will be used is leading to more efficient utilization of petroleum solvents.

There are certain trends in the industrial economy and also in the construction field which affect petroleum solvents. Due to versatility of their use in the paint and varnish industry and many others, petroleum solvents can expect to have a small but continued growth in the future. This is based on the growth of the general economy. It is fortunate that petroleum solvents have many other end uses because the increase in water emulsion coatings is very detrimental to petroleum solvent growth. The use of water emulsion systems seems to indicate that petroleum solvent growth in interior trade sales has slowed down considerably. Exterior coatings are also using fewer petroleum solvents in their overall formulation. This is overcome somewhat by continued growth in resin systems that require petroleum solvents.

The only exception to the supply situation of petroleum solvents is benzene and this shortage is expected to continue during the coming months.

With the possible exception of toluene and xylene, it seems reasonable to assume that there will be little or no change in the pricing of these products.

The benzene shortage which is now world wide has focused the attention of petroleum refiners on this product. Although a number of new plants have been announced such facilities are very costly as they usually require at least one year to complete. Meanwhile refiners who are presently producing benzene have been looking at their

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Chicago, Ill.—Fred A. Jensen & Associates, 510 N. Dearborn St.
Cincinnati, O.—C. L. Zimmerman Co., N. 303 Cincinnati Union Terminal
Dallas, Tex.—Thompson-Hayward Chemical Co., P. O. Box 6226
Denver, Colorado—Application Engineers, Inc., 2150 S. Bellaire St.
Detroit, Mich.—Matteson-Van Wey, Inc., 16901 West 8 Mile Road.
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Houston, Tex.—Thompson-Hayward Chemical Co., P. O. Box 4557
Huntington, W. Va.—Cabell Chemical Co., 101 22nd Street
Jacksonville, Fla.—C. Withington Co., Inc., 1641 Landon Ave.
Kansas City, Mo.—Thompson-Hayward Chemical Co., 2915 Southwest Blvd.
Little Rock, Ark.—Thompson-Hayward Chemical Co., 3100 W. 65th St.
Long Island City, N. Y.—C. Withington Co., Inc., 47-40 Fifth St. (for paint only).
Los Angeles, Cal.—Harwick Standard Chemical Co., of California, 7225 Paramount Blvd., Rico Rivera, Cal.
Memphis, Tenn.—Thompson-Hayward Chemical Co., 1585 Harbor Ave.
Oklahoma City, Okla.—Thompson-Hayward Chemical Co., 3909 S. Meridian Ave.
Omaha, Neb.—Thompson-Hayward Chemical Co., 1110 S. Fourth St.
Philadelphia Area, Pa.—Van Horn, Metz & Co., Inc., 201 E. Elm Street, Conshohocken, Pa.
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Portland, Ore.—Cordano Chemical Co., 56 S. E. Belmont St.
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San Antonio, Tex.—Thompson-Hayward Chemical Co., 222 Seguin St.
San Francisco, Cal.—Harwick Standard Chemical Co. of Cal., c/o Bay Cities Warehouse, 4001 Hollis St., Emeryville, Cal.
Seattle, Wash.—Great Western Chemical Co., 6900 Fox Ave.
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existing aromatic facilities with the idea of maximizing their benzene output. In many cases this can be accomplished at the expense of toluene and xylene, both of which have been in ample supply and are selling at a low prices.

The benzene shortage has also created a new outlet for toluene in the recently announced hydrodealkylation plants where toluene is converted to benzene by removing the methyl group. This new demand plus the curtailment of production may in the near future up the present low price of toluene and xylene.

New Developments

A significant technological development was Shell Chemical's announcement of two high-boiling solvents Pent - oxone (4 - methoxy - 4 - methyl pentanone - 2) and Pentoxol (4 - methoxy and 4 - methyl pentanol-2). Both of these solvents, according to Shell, not only combine the general superior properties of ketones and glycol ethers but can act as strong solvents for such dissimilar resins as acrylic, vinyl, epoxy, urethane and nitrocellulose. As a result they give the formulator a broader raw material base and thereby assure both uninterrupted supply and price stability. Another feature of these versatile solvents is that it will enable coating manufacturers to reduce the variety and volume of their solvent inventories. One of the most important properties of Pent-oxol it is high toluene dilution ration of 4.6. This makes it possible for the coating manufacturer to use the lower-cost diluent in greater quantity and thereby reducing the overall cost of his formulations.

DRIERS AND ADDITIVES

Additives

At the present time, the expected supply situation as it exists for driers, fungicides, bactericides, and general paint additives, appears satisfactory. There is still a noticeable shortage of naphthenic acid but it is not sufficiently severe to prevent the manufacture of the required napthenate driers to the coatings industry. There is the possibility of a shortage in mercury metal or in cobalt metal but this is rather remote unless the international situation worsens considerably.

The continuing growth of water thinned paints is being felt in the additive field. This has to some extent limited the growth of the additives based on solvent based paints such as anti-skinning agents, oil and solvent based bodying and puffing agents, stearate and clay types of anti-settling agents, etc. On the other hand, it has enormously increased the number and amount of additives being used in water thinned paints. Among such additives are anti-foaming agents, pigment wetting and dispersing agents, agents to prevent efflorescence, bactericides, emulsifying agents, etc. This has much more than offset the slight loss that may have resulted from the changeover from solvent based to water based paints. The reason for this is that every gallon of water based paint contains most, if not, all of these additives. Oil based paints, on the other hand, might have contained only one or two such additives, or perhaps none at all.

The tremendous influx of water thinned paints has also helped the growth of water soluble fungicides and bactercides. By far the most important product used for this purpose is solubilized phenyl mercury acetate. In minute quanti-

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ties it is used as a low cost bactericide to prevent paints from putrifaction. In larger quantities it is used as a functional and low cost mildewcide for use in exterior coatings, or in exterior coatings that are prone to mildew growth.

Driers

The only area where the growth of water thinned paints has hurt the additive picture has been in the field of driers. Practically none of the interior water thinned paints contain driers. Only those exterior paints that have an oil or alkyd modifier normally contain drier and even then it is usually only a small amount, since it is based on the amount of modifier used. On the other hand there is some evidence to indicate that even in non oil or alkyd modified water thinned paints, the use of water dispersible driers has speeded the rate at which these paints become washable and as a result a new water dispersible drier industry seems to be forming.

In exterior oil and solvent based paints there is an increasing demand for solvent based phenyl mercurials due to the recent growth of blister resistant paints. Such paints are normally zinc-oxide free and these require much larger quantities of fungicides in order to protect them for excessive fungal attack. There is also an increasing recognition of the importance of putting a fungicide in exterior oil based finishes whether they are used as a base for oil based or water based finish coats. The manufacturers of many water based exterior paints recommend a zinc free oil finish as a base for the use of their water paints when they are used over wood. Such paints are being formulated increasingly with mildewcides containing phenyl mercurials.

The increasing improvement in tall oil and tall oil acids has improved tall oil driers to such an extent that they can be used satisfactorily in most paints. Price wise they represent an appreciable saving. Even more impressive, quality wise, are the new oleate-linoleate driers. Being based on drying oil acids rather than on non-drying naphthenic acid, the oleate-linoleate driers show good drying efficiency and lack odor and color. Selling at the tall oil drier price, they represent both a quality and price advantage over other types of driers. In some instances they have even replaced octoates.

The trend in our paint and allied industries is therefore in the natural growth and greater use of fungicides and additives. The drier picture is still in a state of flux with indications that it might be slowly decreasing.

New Developments

Significant developments in the field of additives were noted during 1960. Of particular interest was a 100% active, nonionic emulsifying agent, designed for the preparation of oil based emulsion house paint primers and finish coats. Developed by Advance Solvents and Chemical, this emulsifying agent (Advawet #43) is miscible in both oil and water and is soluble in water in all proportions. It is also stable in the presence of aqueous solutions of acid and alkali. It will not form salts with metal ions and is, therefore, equally effective in hard and soft water. According to the manufacturer, this product combines both emulsifying and wetting properties necessary for the preparation of water reducible coatings. Oil based primers and finish coats can be formulated as emul-

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sion systems with very little change in basic formulation.

The most recent contribution that silicone technology has made to the protective coatings field, is a new series of paint additives. Designed to increase efficiency of application as well as improve durability and appearance of protective coatings, the syl-ad additives by Dow Corning Corporation were developed as specific aids for paint formulators. As little as 0.05 to 0.1 per cent syl-ad 1, for example, is said to prevent floating, flooding and silking in a wide variety of finish coatings. Not only is effective pigment control accomplished, but the surface can be recoated without difficulty. Syl-ad 2 is similar to syl-ad 1, but is a more economical additive where re-coat ability is not necessary. Dow Corning also claims that dip coating operations can be simplified by the improved flow-out and leveling characteristics imparted to lacquers and paints by syl-ad 6. This additive also reduces orange peel in spray processing.

Another silicone additive, syl-ad 11, reduces the surface friction of coatings. This smooth slipperiness results in increased mar and scuff resistance for the finish.

Attractive textured finishes can be created by using syl-ad 16. For example, with baking and air-drying enamels a variety of fine grain surfaces can be produced; with enamels containing non-leafing aluminum pigments, a hammer finish is obtained. For textured finishes the desired concentrations of syl-ad 16 range from 0.05 to 0.5 percent. For producing hammer finishes, syl-ad 16 is added in concentrations ranging from 0.1 to 0.5 percent. As the concentration of syl-ad 16 is increased, the grain in the finished coating becomes finer.

Other additives of interest are a suspending agent by Daniel Product Co. for all pigments forming hard sediments and is primarily designed to prevent hard or gelatinous settling of ultrafine silicas in lacquers and other finishes; ultraviolet absorbers (Uvinul N-35 and Uvinul N-38) for protecting nitrocellulose lacquers against UV degradation, without adding undesirable color to the coating by General Aniline; Union Carbide's quick-dissolving water soluble resin, Cellosize hydroxy-ethyl cellulose QP-4400 as a protective colloid stabilizer in latex paints; Hercules Powder's water-soluble polymers (Ceron) useful as thickener, protective colloid, and suspending agents; thickener, Modicol VI, for latex paints by Nopco; Harshaw's water dispersed driers, Meletex for use in all latex and pigment dispersion systems, and a sodium borate in soluble powdered forms for use in latex base paint to produce flame retardant coatings by U. S. Borax.

Plasticizers

Due to the continued shortage in phthalic anhydride, supplies of phthalate plasticizers remain tight with no relief expected in the immediate future. Meanwhile tricresylphosphate is being used in increasing amounts as most users of phthalate esters have been allocated only 50% of their requirements.

Acknowledgement

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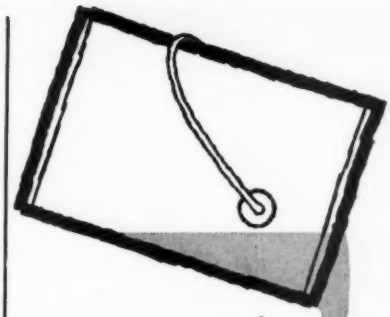

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TECHNICAL REPORT
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Dicalite Research Throws New Light on Testing for Gloss and Sheen

Unexpected results obtained during a three-month research project in the Dicalite products laboratory at Walteria, California, may provide an answer to test inconsistencies which have puzzled paint technicians.

This research was undertaken to evaluate fillers and inert pigments as flatting agents, with particular reference to particle size range and distribution.

Formulations were first checked by Hegman gauge to measure the fineness of grind of the inert pigments. Paint films were then drawn down on standard 1/16″ steel test plates for checking with the glossmeter and the flatness gauge.

At this point puzzling inconsistencies began to be apparent.

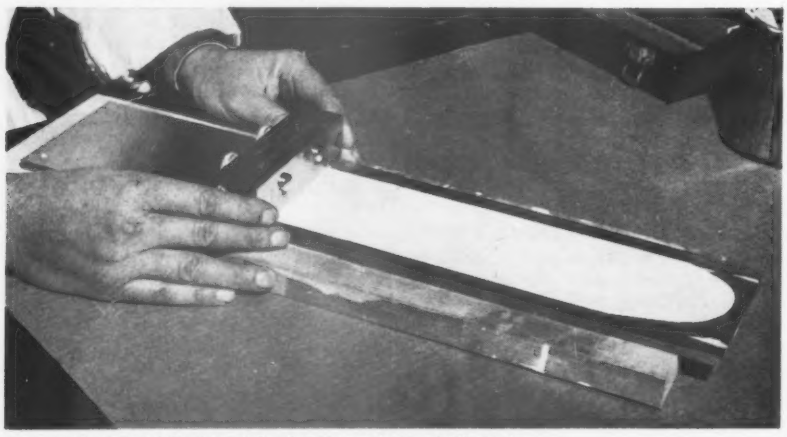
Repeated tests on identical formulations under identical conditions gave variable results. After thoroughly checking all the factors involved, it was discovered that the test plates could not have a sufficiently true surface. Since flatness and gloss are a function of the thickness of the paint film, all other factors being equal, an absolutely true plane surface is essential for accurate and reproducible readings. The problem was solved by the use of special steel plates ¼″ thick, with a machined surface perfectly flat within tolerances less than 0.0005″.

Using these plates, reproducible results were obtained in all succeeding tests. Paint films, 0.003″ and 0.005″ thickness, were drawn down with a Boston-Bradley adjustable blade, and checked for gloss and sheen at 60° and 85° angles. All tests were made without possibility of bias: formulations were blind coded. As a point of interest, all Dicalite materials produced for paint use were found to have Hegman readings in the 3 to 4 range.

It may be stated, on the basis of these tests, that in testing for degree of gloss or sheen, variations from a true plane surface in the test plate (and hence in the thickness of the paint film) will produce wider differences in the readings than will the widest variations in available filler materials and flatting agents.

To the best of our knowledge, no reference to this effect has appeared in trade literature.

The Dicalite products laboratory welcomes comments regarding similar testing procedures.



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W. R. SMITTLE

DICALITE'S "MAN ON THE SPOT"

One of the busiest men in the organization is W. R. Smittle, in charge of quality control and customer service work in the Dicalite products laboratory at Walteria, California.

In Smitty's fifteen years with Great Lakes Carbon Corporation he has run or supervised tests or research on everything from antibiotics to zein, including practically every chemical in commercial use. One of his accomplishments was original work leading to the successful filtration of the bacterial excrements known as pyrogens, which many authorities, until then, had claimed were non-filterable.

Smittle obtained his Master's degree at the University of Illinois, after graduation from Kansas State University, and for the eight years prior to joining Great Lakes Carbon was employed in the technical department of Bowman Dairy Company, in Chicago.

The paint research reported in the accompanying columns was conducted under his direction.

NEW DATA SHEETS

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UVINUL products can be incorporated into UV-sensitive material directly – or can work in a protective shield, wrap, or coating. The table below suggests areas of use. Our chemists can help you apply the UVINUL absorbers effectively – and meanwhile, you can easily test their protective power by using clear cellulose acetate sheets containing UVINUL D-49. Just fill out the coupon and mail it to Antara for your free supply and directions for use.

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Cellulose Acetate	X		XX				
Latex					XX		XX
Nitrocellulose	X	X				X	XX
Paints, Oil-Base		XX	XX	XX		X	
Paints, Water-Base	X	X	X	XX	XX		
Polyester Resins	XX			X			X
Polyolefin Resins†							
Polystyrene	XX					XX	
Polyvinyl Chloride (PVC)	X		XX			X	
Rubber	XX					XX	
Urea-Formaldehyde Resins							XX
Urethanes		XX	X	XX			
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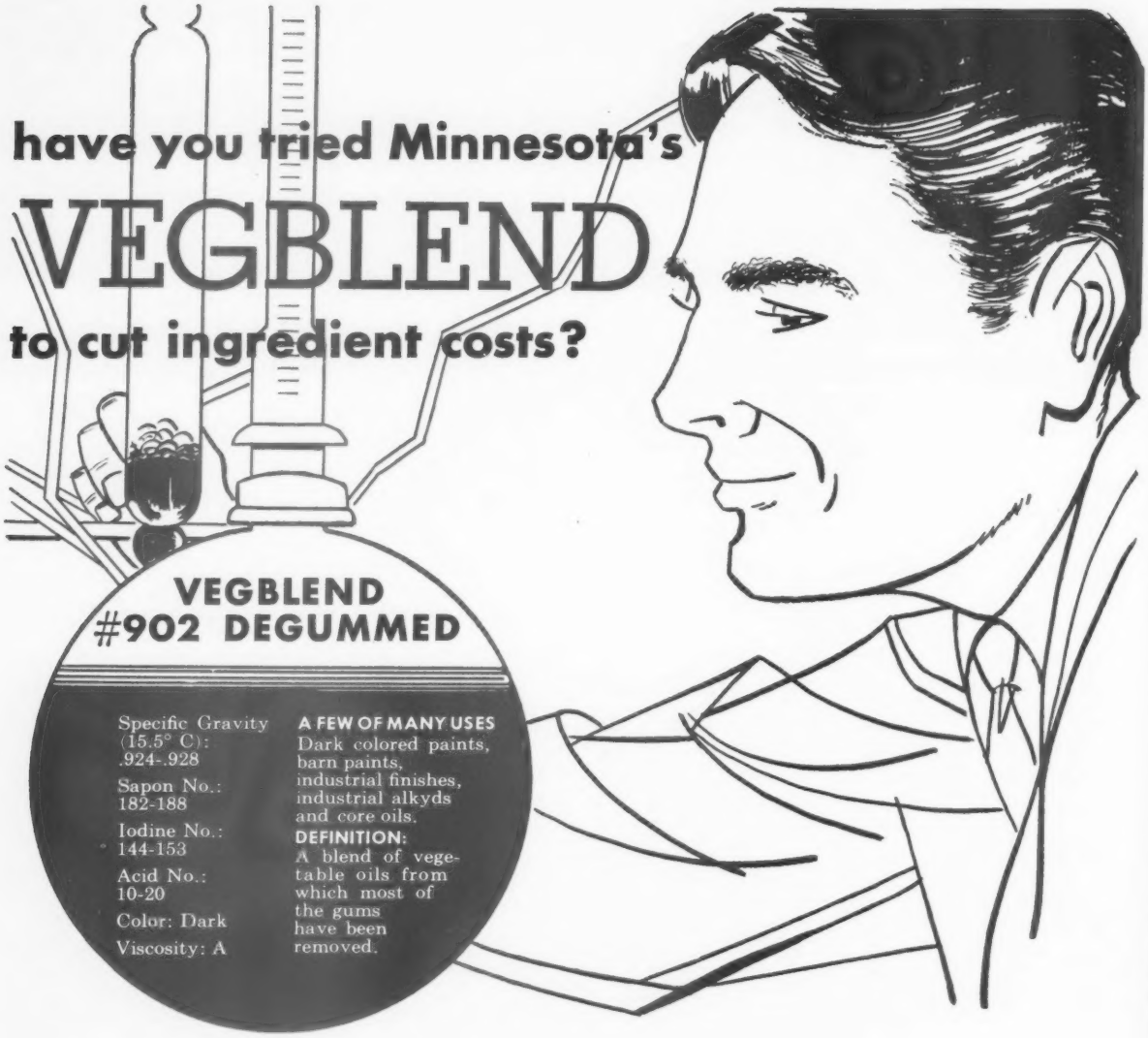
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THE *NEW* TUNG OIL INDUSTRY

Formation of the Pan American Tung Research and Development League in 1958 paved the way for the expanded coatings research utilizing tung oil.

By
Tom Epperson*
R. O. Austin**

Pan American Tung Oil

IN December of 1958, a unique joining of forces occurred which brought together agricultural producers from two widely separated countries to carry out a joint program of research. This program was designed for the benefit of tung producers in both the United States and Argentina, and for the ultimate benefit of the consumers of their agricultural commodity—primarily the coatings industry.

At that time, tung producers from the United States and Argentina joined in the formation of the Pan American Tung Research and Development League, pledged to a program of tung oil research and development that would expand the usage of a coating ingredient whose unique properties had been known for centuries, but never fully exploited by basic and applied research.

This program was to be financed by tung producers of the two countries that make up the bulk of the supply of tung oil from the free world. The two aims of the League were to expand tung oil usage through research and to assure a ready supply of this oil to American consumers, so that these consumers would never again be subjected to short supplies which plagued the coatings industry during the days when supplies had to come from China.

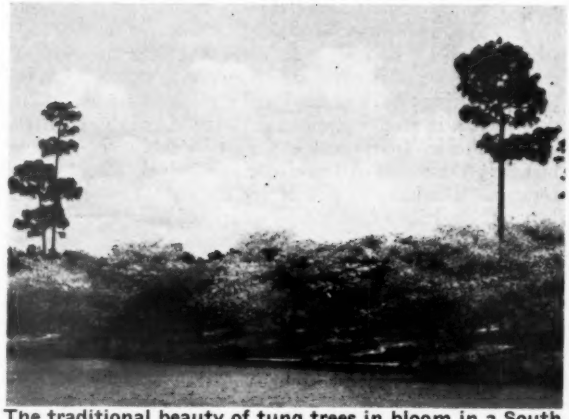
So far as can be determined, never before in history had such a project been attempted. Distance barriers, language barriers, difference in customs and many more obstacles seemed to make the joint endeavor an impossibility.

Now, after a little more than a year of cooperative work by the League, it is readily apparent that the need overcame the barriers, and the research program is well on its way toward helping three important groups—United States tung producers, Argentine tung producers, and tung oil consumers.

Behind the League's formation is a story known in part, if not in entirety, by most in the coatings industry.

Tung oil first came to the United States as an ingredient for use in making high quality spar varnishes.

By 1909, the United States was importing 43 million lbs. of tung oil. This figure gradually increased until by 1929 the figure had mounted to 130 million lbs. and by 1936 total imports of tung oil were 150 million lbs.



The traditional beauty of tung trees in bloom in a South Mississippi orchard.

U. S. Consumers encountered many problems in the use of this imported oil. Shipments were always uncertain. A practice developed for a period of time of adulterating Chinese tung oil with cheaper oils. There was a great variance in the quality of the oil due to poor production and milling methods. Consumers were always faced with wide price fluctuations which made cost estimates difficult.

In 1902 some tung seed were planted in the San Joaquin Valley of California to determine if tung could be grown in the United States on a commercial basis. Although the California plantings died, seedlings planted the next year in the southern states did live. A tree planted in a cemetery at Tallahassee, Florida, was the mother tree of the domestic tung industry. From this tree, other plantings were made and the industry spread across the lower gulf states.

In all practical aspects it was a new agricultural plant in America because the primitive, almost forest-like mode of its handling in China gave no information on its culture under modern conditions.

By 1912, however, an experimental planting had been made in Florida and within a few years, research work was under way in South Carolina, Georgia, Alabama, Mississippi, Louisiana and Texas. The experimenters were seeking to

*Editor, American Tung News
**Technical Director, Pan American Tung Research and Development League

A mature, well cared orchard being inspected by Roland R. Becke, left, Exec. Sec. of the American Tung Oil Assoc., and J. Riley Rankin, grower-manager in Pearl River County, Miss.

determine first whether tung oil could be grown profitably in this area, and second to determine practices conductive to efficient production.

Commercial Plantings

In 1932, the first commercial crop of tung nuts was obtained from groves in Florida, and the yield of oil amounted to 60,000 lbs.

By 1936, the domestic industry was producing 2 million lbs. of oil. This figure was increased to 3 million lbs. in 1939, 5 million in 1943, 10 million in 1945, 20 million in 1949, 40 million in 1953 and our record 44.5 million in 1958. When the tung producing area, now known as the Tung Belt, was finally determined, it stretched along a 100-mile strip next to the Gulf of Mexico from north and west Florida to east Texas, including the states of Louisiana, Mississippi, Alabama and Georgia. The industry now represents a total investment of fifty million dollars with annual returns of ten million dollars.

Consumption of tung oil in the United States continued high until the beginning of World War II. In 1942, total imports of tung oil were only 68,000 lbs., as tung oil was unable to find its way from Chinese ports because of the war. With domestic production still at too low a figure to aid domestic consumers, the consumption of tung oil dropped to 12 million lbs. in 1942.

Due to the almost complete stopping of imports during this period, the price of tung oil, f. o. b. New York, ranged from a low in 1939 of 13.75 cents to a high of 38.38 cents in 1942.

By 1947, imports were back up to 140 million lbs. and consumption rose to 130 million lbs.

But again domestic consumers were hit by short supplies and high prices when the Korean conflict broke out and the U. S. placed an embargo on all tung oil from Red China.

In 1952, imports had dropped to 13 million lbs. and consumption dropped to approximately 50 million lbs., a figure which has been maintained since that time.

By this time, the domestic tung industry was beginning to be of value to U. S. industries with a production in 1952 of 40 million lbs.

It had become evident to United States tung producers much earlier that an organization was needed to provide healthy promotion and guidance for the industry. In 1933, the American Tung Oil Association had been formed to provide this service.

But it now became evident to these producers that the industry must perform two other functions if they were to hold their position in U. S. agriculture—marketing and research.

Marketing Organization

In 1953, The National Tung Oil Marketing Cooperative was formed with this dual purpose in mind. The Co-op was needed to assure orderly marketing of the domestic tung crop, and to help stabilize the price of domestic oil. Since that time, the price of domestic oil has been relatively stable. Yearly contracts are made available to consumers by the Co-op to protect the customer and to help in establishing yearly cost estimates.

The research work initiated by the Co-op began on a very limited scale. The first project was placed with W. M. Grosvenor Laboratories, Inc., New York, N. Y. This was a project to study the use of tung oil in outside paints.

In March of 1955, Mr. Jack Sanderson, formerly chief chemist and plant supervisor of the Ohio Varnish Company, was employed by the Co-op as a technical salesman to help in the location of technical problems in the use of tung oil and to report to the coatings industry any new discoveries in the use of tung oil.

On April 1 of that same year, Jack Greenfield, formerly head of resin research at the New Jersey laboratory of Archer-Daniels-Midland Co., was hired by the Co-op to work in a laboratory leased by the Co-op from the Industrial Resin Corporation, Whippany, N. J. One of Mr. Greenfield's duties was to prepare technical bulletins on the use of tung oil for dissemination to the protective coatings industry.

These bulletins, known as American Tung Topics, are still being printed and are being sent without charge to 2500 persons in the coatings industry.

In July of 1955, an industry fellowship for research on tung oil was established by the Co-op at the Southern Utilization Research and Development Division of the USDA's Agricultural Research Service in New Orleans, La. The Southern Regional Research and Development Division conducts a considerable amount of utilization research on tung oil. The fellowship was set up to give additional personnel and experience to the work of solving coatings problems through the use of tung oil. Recipient of the fellowship was Lucien L. Hopper, Jr., of Hopper Varnish and Research Co., in New Orleans.

It became apparent that the magnitude of the research work that was necessary by the tung industry was too great to be handled through the Marketing Co-op, and that a new organization needed to be organized for the sole purpose of conducting research and development work on tung oil.

Tung League

On June 9, 1956, the Tung Research and Development League was formed as a non-profit corporation to carry out

A close-up of tung nuts and leaves.

research work on tung oil with finances paid by the tung growers on each pound of tung oil produced.

While organization meetings were held and ground work was being laid for a research program, the first of the meetings were held which ultimately led to the formation of the Pan American Tung Research and Development League.

Late in 1953, an influential grower from Argentina spent several days in the U. S. Tung Belt seeking a common ground for participation of Argentina in the U. S. market for tung oil.

The Argentine tung industry had been started in 1928 by seeds sent from the United States. The first commercial groves were planted in 1939. The industry there grew almost simultaneously with the U. S. industry, and production almost parallels the production here. Argentine entry into U. S. markets could have both advantages and disadvantages.

The advantage of the Argentine tung industry was the fact that, with two suppliers of tung oil from different sides of the equator, American consumers would never have to worry about not having a continuous supply of tung oil, a difficulty which had plagued the coatings industry prior to the development of tung industries in the United States and Argentina.

The disadvantage in the Argentine entry into U. S. markets was the possibility their tung oil would act as a demoralizing factor on prices, leading to wide price fluctuations to the detriment of not only the producers in both countries, but to consuming industries as well.

The only answer seemed to be a joint research program to create a demand for all the tung oil produced in both countries. But the problems seemed insurmountable in organizing such a joint program.

Negotiations moved very slowly from 1954 to 1956. Distance, language and other barriers had to be overcome.

In July of 1957, the Comision Argentina del Tung was formed by Argentine growers to parallel the Tung Research and Development League in the United States. This was the first big step in effectuating the Pan American League.

During that same month, a meeting was held in New Orleans, La., between representatives of producers in the United States and Argentina, as well as officials of the Argentine government.

To further speed negotiations, a three-man committee from the United States visited Argentina in March 1958 to learn more about the Argentine tung industry and to help in coordinating the thinking behind the proposed league.

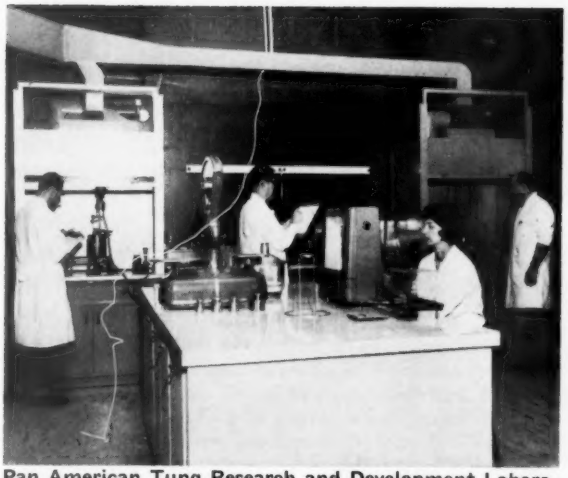
Results followed quickly. A proposed program of jointly financed research and development was approved by the Comision Argentina del Tung late that summer. The same program was approved by U. S. producers at the 1958 Tung Convention in October.

Finally, on December 15, 1958, the Pan American Tung Research and Development League became an actual fact, after more than 4 years of negotiations. An organizational meeting was held on that date in New Orleans, La., at which time representatives of the producers in both countries signed the charter which marked an achievement unparalleled in history.

The friendship between the two groups of producers and the tone of thinking behind the organization of the Pan American League can be sensed from a letter written to Mr. Roland R. Becke, Secretary—Manager of the League, from Julian M. Szychowski, Manager of the Argentine Tung Commission, after his return to Argentina.

"I think that the work accomplished for the constitution of the Pan American League has been satisfactory", Mr. Szychowski said, "not only for having been able to realize an old, common aspiration, necessary for the future economic development of tung oil and the expansion of the consumer's market, but also to situate the discussion of whatever problem on a plane of reciprocal consideration, deferential friendship."

The realization of the Pan American League was only a small beginning. The type and direction of the work to be done by the League was the next problem.



Pan American Tung Research and Development Laboratory, Picayune, Miss. Left to right: William Austin, laboratory technician, R. O. Austin, research director, Mrs. Naomi Marchini, technician, and Robert S. Zetterberg, chief chemist.

Research Laboratory

After several meetings of the Executive Committee of the League, it was decided that the first and most urgent requirement was the establishment of a research laboratory. Picayune, Miss., was selected for the location of the laboratory and work began immediately to equip and staff it.

By late summer of 1959, the laboratory was ready, and in October, Mr. Robert S. Zetterberg, a paint chemist formerly with Crosby Forest Products Co., was hired by the League and began work in the laboratory.

To speed the work of the League, it was necessary to "farm out" projects to University and private laboratories, as a complement to the work to be done by the League's own laboratory.

In January, 1960, a project designed to learn more about the exact characteristics of tung oil was initiated by the Pan American League at North Dakota Agricultural College, Fargo, N. D. The project is directed toward determining by use of infrared spectroscopy the changes which take place in tung oil during the process of gas-proofing. This work is being carried out under the direction of Dr. A. E. Rheineck, Professor of Coatings Technology at the College.

It is hoped the project will determine specifically the types of gasses which influence the film formation of tung oil, and determine what, if anything, replaces the triply conjugated system of unsaturation during the gas-proofing process.

Another project was begun with Borden Chemical Company in order to learn more about the dispersion of tung oil in coatings films.

The big need of the Research League was a Research Director to coordinate the laboratory work and outside projects being done by the League.

In February, 1960, Mr. R. O. Austin was selected to fill this position. Mr. Austin was selected for his wide experience in the fields of chemicals, resins and oils. Prior to coming to the League, Mr. Austin had been with Crosby Chemicals, Inc., of Picayune, Miss.

Chemical Derivatives

The newest project begun by the League is a research project in Argentina to prepare chemical derivatives of tung oil. The project, which will extend over a period of approximately three years, will be the first extensive basic research on the preparation of chemical derivatives of tung oil.

The project will center around the preparation of derivatives of alpha-mono-eleostearin and its dimers and the preparation of products from eleostearic acid by oxidation. Some of the new derivatives will be available in from 6 to 12 months and

will then be sent to the United States for industrial testing and evaluation. Although the actual application of these new derivatives is unknown, the field seems unlimited.

The work by the League's Laboratory has become more comprehensive as new personnel gain familiarity with the use of tung oil, and as manufacturers and consumers relay their coatings problems to the League.

Some of the projects now under study at the laboratory are as follows:

1. Yellowing characteristics of tung oil as related to other oils and a correlation of these results between the accelerated yellowing cabinet, diffused light and total darkness.
2. The application of emulsifiable tung oil to water thinnable paints for adhesion to chalky surfaces has been underway for some time and is a highly successful, inexpensive method for solving this problem.
3. Studies on the use of tung oil in alkyds at 70%, 60% and 55% total oil content and containing from 10% to 100% tung oil have been underway for some time. The work completed to date is reported later in this article. Handling techniques are included.
4. Improvement of adhesion of water thinnable paints to steel in dipping and spray gun operations.

Although most coatings technicians are familiar with formulations and the cooking of varnishes, detailed information on oleoresinous varnishes in low capital cost smaller units are being accumulated for use as a ready reference source, along with a wide range of test results not generally available. A considerable part of this work is included in this publication.

The Pan American Tung Research League is devoted to the research and development of techniques that should be of considerable help to the coatings industry. The League is always ready to cooperate with those interested.

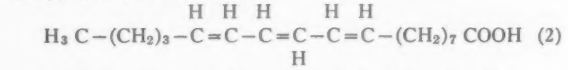
Composition of Tung Oil

Tung oil will supply many superlative qualities to coatings that cannot be obtained from any other oil to the degree supplied by this unique drying oil. These characteristics are attributed to the high eleostearic acid content. A typical analysis of the American product is shown in Table I.

Table I: Fatty Acid Constituents of Tung Oil (1)

Eleostearic acid	82.0%
Linoleic acid	8.5
Oleic acid	4.0
Saturated acids (Palmitic)	5.5
Total	100.0%

There are two types of principal eleostearic acids that have been identified, (alpha and beta). These are cis and trans and the only difference in their structure are (1) cis, trans, trans and (2) trans, trans, trans.

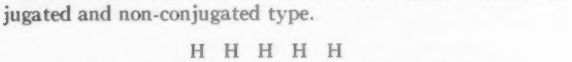


9— cis, 11—trans, 13 trans—octadecatrienoic acid

or

9—trans, 11—trans, 13—trans octadecatrienoic acid

Linoleic acid with two double bonds can occur in both conjugated and non-conjugated type.



9—cis, 12 cis—octadecadienoic acid

The structural formula illustrated above is the non-conjugated type. The conjugated linoleic acid would be designated 9, 11, or 10, 12—octadecadienoic acid depending on the direction of the double bond shifts.

Linolenic acid has not been found in tung oil. Oleic and saturated fatty acids account for less than 10% of the total. Where the glycerides are concerned, these acids are most likely co-esterfied with eleostearic rather than existing as the pure glycerides.

In tung oil, practically all of the eleostearin is the alpha type.

Specifications have been established by the American Society for Testing Materials and the Federal Government.

Table II: Comparison of Specifications for American Raw Tung Oil.

		Federal	ASTM
Specific gravity, 25/25°C.		0.935-0.938	0.935-0.938
Color, Gardner 33	max.	15	14-15*
Acid Number	max.	8	8
Saponification number		189-195	189-195
Unsaponifiables, percent	max.	0.75	0.75
Iodine number (Wijs)	min.	163	163
Refractive Index, 25°C.		1.5165-1.5200	1.5165-1.520
Heat Test, Minutes (Mod. Brown)	max.	12	12
Loss on heating 30 min. 103-105°C. Percent	max.	0.3	
Foots, percent	max.	1.0	
Appearance		Clear, free from sediment and suspended matter.	Clear, transparent at 65°C.

*1.0g. $K_2Cr_2O_7$ in 100 ml. of pure H_2SO_4.

The ASTM specification for low acid number and pale color are the same as above except the acid number should be reduced to 3.0 and the maximum color 0.03g. of $K_2Cr_2O_7$ per 100 ml. of H_2SO_4 (5-6 on the Gardner 33 scale.).

Although specifications permit a maximum color of 15 on the Gardner 33 scale, typical analysis of American tung oil is lighter than 10.

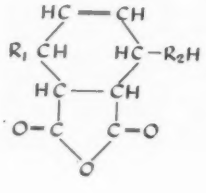
The conjugation of the eleostearin makes it capable of polymerizing within the tri-glyceride molecule as well as build higher molecular weights with other molecules. This polymerization can be carried out at a rapid rate by the application of heat alone. However, tung oil can be stored for several years without deterioration. An inert atmosphere is not required.

Although the principal use for tung oil is in the preparation of oleoresinous varnishes, its chemical constitution indicates many possibilities for improved products in the coatings field.

Triglycerides of tung oil may be readily halogenated. An interesting series of reactions with chlorine were carried out by R. S. McKinney, et al, at the Southern Regional Research Laboratory. They carried out the reactions at 0-20°C. and at 75°C. The reaction is highly exothermic and a method for cooling the flask is necessary. At the 40-50% chlorine level, they produced a stable product compatible with polyvinyl chloride. (3)

Due to the trans trans conjugation of both alpha and beta eleostearic acid, dienophiles react readily with tung oil forming adducts in accordance with the Diels-Alder synthesis.

The reaction product with alpha eleostearic acid and maleic anhydride produce an adduct with a melting point of 64°C. The structural formula follows:

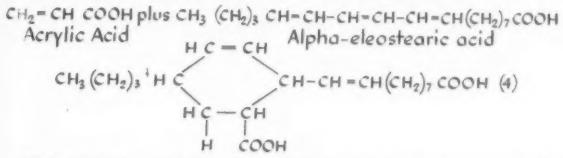


(4)

$R_1 = CH_3(CH_2)_3-$

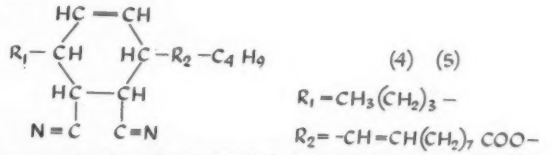
$R_2 = -CH=CH-(CH_2)_7-COO-$

Another unusual reaction is the utilization of acrylic acid with alpha-eleostearic acid forming a second free carboxyl group when the fatty acid is used as a raw material.

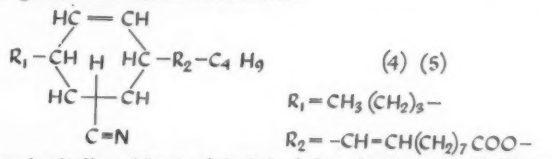


This adduct contains a cyclohexene nucleus and an exocyclic double bond outside the nucleus. The reactive carboxyl groups may then be used for esterfication or other reactions.

Cyano (C≡N) groups can be formed with fumaronitrile or acrylonitrile and eleostearates. The Cyano group is on the cyclohexene nuclei of the adducts. The structural formulas are shown below:

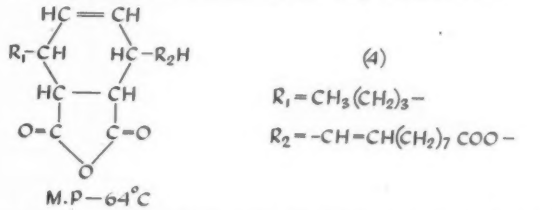


Fumaronitrile adduct of butyl alpha-eleostearate. Boiling range 217-226° C/90-230 microns.



Acrylonitrile adduct of butyl alpha eleostearate Boiling range 183-188° C/60-70 microns.

The triglycerides are similar to the butyl eleostearates.



These derivatives of tung oil and tung oil fatty acids are interesting intermediates that should have possibilities in the coatings and plastics field as plasticizers and film formers with resins of various types.

Yellowing Characteristics

As tung oil does not contain linolenic acid, a major factor in the yellowing of paint films utilizing Linseed Oil (6), then it should follow that tung oil will not yellow to any greater extent than Soybean (about 7-8% linolenic) or safflower (0.4-0.13% linolenic).

The Pan American Research Laboratory is making an extensive study on this subject to determine the extent alkyds containing tung oil will yellow as compared to single oil systems in the accelerated yellowing cabinet using ammonia as the yellowing reagent.

Oils used were refined soya, safflower, white refined linseed and American tung oil. The latter, where used, was 30% of the total oil content of the alkyd.

All of the pentaerythritol esters containing tung oil wrinkled with the method utilized and were eliminated from this study. However, the safflower-tung PE alkyd produced an air dry opalescent white hexagon wirnkle finish that should be of considerable interest to manufacturers and consumers of these type coatings.

Very low PVC alkyd gloss enamels were formulated to emphasize film yellowing.

Table IV: Standard Paint Formula for Yellowing Tests

	Pounds	Gallons
Titanium Dioxide, Rutile	200	5.72
Zinc Oxide Lead free	10	.21
Alkyd vehicle	576	76.00
Mineral Spirits	166	25.40
Lecithin	4	.51
Cobalt Napthenate 6%	3	.38
Zirconium Napthenate 6%	5	.20
Anti-skinning agent	2	.27
Total	966	108.69
Analysis Range:		
Viscosity, K.U.	68-78	
Grind, North Scale, min.	8	
Pigment volume conc.	11.3-14.7	

The quantity of mineral spirits was varied in the various formulas to obtain a constant viscosity. All alkyds containing tung oil produced higher viscosities and considerably faster kettle cycles than those not containing this oil. This factor is reflected in the PVC range.

A 6 mil. wet film was cast on glass and air dried to a hard film. The color comparisons in the yellow range were determined with the Gardner Color-difference meter. Then placed in the accelerated yellowing cabinet with 100 ml. of 29% ammonium hydroxide in a 150 ml. beaker and sealed.

The panels were left in the sealed cabinet for 19 hours for a drastic treatment to over-emphasize small differences, although 6 hours is usually specified, then read with the color difference meter at 2 hours, 24 hours and 48 hours after removal from the cabinet.

All of the alkyds containing tung oil produced a considerably faster drying, harder film than with the other oils and accounts for the low unexposed readings obtained without tung oil. After removal from the cabinet the soya and safflower

Table III: Long Oil Alkyds, 23% PA, 70% Oil.
(Grams)

	Z-78	Z-79	Z-83	Z-84	Z-91	Z-92
Tung Oil	202	—	—	202	—	202
Soybean Oil	454	656	—	—	—	—
Safflower Oil	—	—	656	454	—	—
Linseed	—	—	—	—	656	454
Glycerine	120	115	115	120	115	120
Phthalic Anhydride	240	240	240	240	240	240
Kettle time, hrs.	11	26	18	9	15½	10
Final Analysis:						
Color, Gardner 33	6	6–7	6	6	6	7–8
Viscosity, Gardner	Z_1-Z_2	W	R	V-W	Z_3-Z_4	Z_3-Z_4
Non-volatile, %	60	70	67	60	70	60
Acid value	2.4	8.2	8.2	2	9.4	3.7
Pounds per gal.	7.7	8.0	7.9	7.7	8.0	7.7

NOTE: 0.2% litharge for alcoholysis and 0.1% phosphoric acid for color control were added to each batch.

Table V: Color Difference Meter Results and Effect of Time After Exposure.

Type	Unexposed	2 hrs.	24 hrs.	48 hrs.
Soybean Alkyd				
Reading	3.9	12.1	13.0	14.5
Difference		8.2	9.1	10.6
Soybean-Tung Alkyd				
Reading	5.3	15.7	14.9	15.4
Difference		10.4	9.6	10.1
Safflower Alkyd				
Reading	3.8	14.4	14.5	14.6
Difference		10.6	10.7	10.8
Safflower-Tung Alkyd				
Reading	5.4	17.3	16.3	16.4
Difference		11.9	10.9	11.0
Linseed Alkyd				
Reading	3.1	13.4	12.7	13.3
Difference		10.3	9.6	10.2
Linseed-Tung Alkyd				
Reading	5.2	19.0	16.8	17.2
Difference		13.8	11.6	12.0

Table VI: Acid Number Reduction of Long Oil Alkyds Containing Varying Quantities of Tung Oil.

(Parts by weight)

	10%	20%	30%	50%	70%	100%
Tung Oil	35	70	105	175	245	350
Soybean Oil	315	280	245	175	105	—
Glycerine	51	53	53	54	56	68
Phthalic Anhydride	114	112	111	109	108	107
Total Kettle Time	6½ hrs.	5 hrs.	4½ hrs.	3¾ hrs.	3½ hrs.	2¾ hrs.
Final Analysis:						
Acid Number	10.1	10.3	10.5	11.5	11.7	5.3
Viscosity, Gardner	C	E-F	H-I	L	Z-Z_1	Z
Color, Gardner 33	6-7	6-7	6-7	7-8	8-9	9
Non-Volatile, %	70	70	70	70	70	70
Wt. per gal.., lbs.	7.8	7.8	7.8	7.9	7.9	8.2
Solvent, Percent						
Mineral Spirits	94	94	94	94	94	—
Xylol	6	6	6	6	6	100

Table VII: Acid Number Reduction of Medium Oil Alkyds Containing Varying Quantities of Tung Oil.

(Parts by weight)

	10%	20%	30%	50%	70%	100%
Tung Oil	60	120	180	300	420	600
Soybean Oil	540	480	420	300	180	—
Glycerine	135	136	141	145	148	165
Phthalic Anhydride	303	299	291	291	286	266
Total Kettle Time	8 hrs.	7 hrs.	6½ hrs.	4¼ hrs.	3½ hrs.	2¾ hrs.
Final Analysis:						
Acid Number	14.2	10.0	13.6	14.6	10.0	10.4
Viscosity, Gardner	N-O	X-Y	Z-Z_1	Z_5-Z_6	Z_2-Z_3	Z-Z_1
Color, Gardner	6	6-7	6-7	7	6-7	7
Non-volatile, %	60	60	60	60	60	60
Wt. per gal. lbs.	7.7	7.8	7.8	7.8	7.8	8.0
Solvent, Percent						
Mineral Spirits	94	94	94	94	90	44
Xylol	6	6	6	6	10	56

alkyds containing tung oil varied in a narrow range but the straight oil continued yellowing for the time under test. Presently it is not known positively why the tung-linseed alkyd gave higher readings but the probable cause is due to the darker initial color of the alkyd and other unknown factors, as other linseed-tung alkyds do not show a difference in accelerated yellowing characteristics compared with linseed.

The results obtained with the accelerated yellowing tests do not show any significant difference in yellowing between soya, and safflower oils as compared with these same oils containing 30% tung oil when the films are permitted to "age" for 24 hours after removal from the cabinet.

In addition to the above, paints were made with the same vehicles but omitting zinc oxide. Results of these tests definitely show the advantage of using zinc oxide for resistance to yellowing and as a help in improving film dry. However, the linseed oil alkyd enamel livered after standing for three weeks. The corresponding paint minus this pigment was stable. All soybean and safflower alkyds were stable.

This laboratory now has underway a study to determine the range of experimental error between paints based on the same formulae with accelerated yellowing and also a correlation between this text and actual yellowing in diffused light and total darkness, if such exists under these conditions. Other tests for controlling yellowing with baked coatings are also underway and preliminary tests show some promise with several of the trialkyl phosphites as additives. A long oil alkyd using a light colored tung oil with Safflower oil is being

utilized in this study. Results of these tests will be published at a later date.

Tung Oil in Alkyds

There are many advantages to the use of tung oil in the manufacture of alkyds provided the proper technique is utilized. Kettle time per batch can be reduced about 50% and this is a quick way to double plant capacity without additional plant investment. Faster dry, resistance properties and a tougher film are obtained.

This laboratory has prepared alkyds of the long and medium oil type containing from 10% to 100% tung oil, based on total oil content. The reactions were carried out in a laboratory size closed alkyd kettle using the solvent system. Fusion methods are also utilized and pilot batches of 500 gallons each in closed portable kettles are being made regularly without difficulty. There is sufficient time for up-heat and plant control except for those alkyds made with 100% tung oil.

When tung oil is added after alcoholysis, acid number reduction progresses to the desired point without excessive bodying. The following table reports the results obtained with varying quantities of tung oil in the preparation of long oil alkyds containing 23% phthalic anhydride and 70% oil, using the solvent process. The percent of tung oil used is based on total oil content.

Where very high tung oil content alkyds are desired, an additional 10-15% glycerine can be added. This lowers acid value rapidly and minimizes bodying of the tung oil.

Alkyds made with 70% and 100% tung oil tended to gas check. This problem has not been solved as of this writing and these two alkyds were included only to demonstrate viscosity increase with a decrease in kettle time as the ratios of tung oil were increased.

After reaching the required acid number, the alkyds must be held for body. The smaller the ratio of tung oil the longer this step in the cycle is required. With a 30% tung oil ratio the additional time required in a glycerol long oil alkyd is about 5-6 hours allowing sufficient time to bring the batch to the desired viscosity without gelling.

In the medium oil range, tung oil can also be used successfully with a corresponding increase in viscosity and reduction of kettle time. The following medium oil alkyds containing 29% phthalic anhydride and 60% oil were made up using the solvent process. The percent tung oil is based on total oil content.

The same pattern of viscosity increase with a corresponding decrease in kettle time is obtained with the medium oil alkyds as with the long oil type. There is sufficient cooking time to permit laboratory control and completion of the batch except for the 100% tung oil alkyd. This latter alkyd can be handled in closed portable systems. However, approximately 60% aromatic on total solvent is required as this alkyd is not completely soluble in mineral spirits.

Conversely, tung oil may be used as a partial replacement for phthalic anhydride, the degree of replacement depending on results desired.

Cooking instructions and handling techniques for these alkyds are given in Table VIII.

Where tung oil is over 25% of the total oil, then all of the soybean oil is charged to the kettle at Step No. 1 and the procedure is continued to the desired acid value and viscosity.

By holding back some of the soybean oil in the No. 1 operation, an alcoholysis can be determined more easily and kettle time can often be saved as a result.

Table VIII: Preparation of Long Oil Alkyds Containing 10-20% Tung Oil, by the Solvent Method.

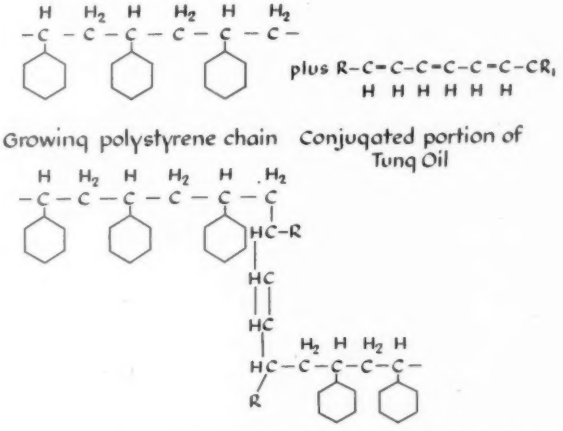
1. Charge kettle with 65 parts of the total Soybean Oil and all Glycerine. Hold back 35% of the oil for addition later in the cook.
2. Raise temperature to 200°C and add 0.2% Litharge catalyst for alcoholysis.
3. Continue heating to 230°C. At this point alcoholysis should be 5:1 ratio in methanol. Hold at 230° if necessary, for further alcoholysis.
4. Add remaining soybean oil and all of tung oil. Temperature will drop to about 220°C.
5. Add 0.1% of 85% Phosphoric acid for color control.
6. Add Phthalic Anhydride and Xylol (about 5% on total charge). Water will start to collect in separator. Temperature will drop to about 200°C.
7. Raise temperature over a period of ½ hour to 220°C.
8. Hold for 3-4 hrs. and check for acid number.
9. When acid number reaches 11, begin checking viscosity samples at 60% solids in mineral spirits.
10. When viscosity of $Y\text{-}Z_1$ is reached, cut off heat and reduce with mineral spirits to 60% solids.

Styrenated Alkyds

Tung oil is an effective, inexpensive and practical reagent in the manufacture of fast drying styrenated alkyds (7). Clear solutions are produced and thermoplastic properties are eliminated.

The conjugation of the eleostearic acid in Tung oil combines with the growing polystyrene chains and limits their size so that oil insoluble high molecular weight polystyrene is not formed. Clear solutions can also be made by use of a large amount of catalyst but this is not desirable.

A simple reaction mechanism follows:



The best procedure for producing the styrenated alkyds utilizing tung oil is a two step method, see Table IX. A method for making a mineral spirits soluble styrenated alkyd is outlined in Table X.

These styrenated alkyds have a remarkable resistance to strong solvents such as gasoline, alkalis, marring at elevated temperatures, etc. The latter makes excellent floor varnishes and porch and deck enamels.

Latex Paints

One of the more serious problems with the latex paints such as PVA's and acrylates have been lack of adhesion to chalky surfaces which has restricted the use of these type paints for outside maintenance work. A method for overcoming this problem has been worked out and subsequently, a number of masonry and wood houses have been successfully re-painted by use of the new method. The old paint on these houses was usually chalked. Some were checked and peeling. The only preparation was to remove loose paint before applying the new coatings and a two coat system was utilized. The primer coat contained 30% emulsifiable tung oil and the finish coat 15% tung oil. After 18 months exposure, there was no indication of failure on any of the houses and they looked the same as when freshly painted (8).

Table IX: Preparation Styrenated Alkyd, Xylol Soluble.

Alkyd Base—Step I

(a)

	Parts
Soybean Oil	30.00
Linseed Oil	11.00
Pentaerythritol	4.03
Glycerine	14.72
Lithium Carbonate	0.03

Temperature is raised to 250°C under an inert blanket with good agitation and held until a solubility ratio of 2:1 in methanol is obtained. Add (b) which should lower the temperature to about 220°C. Use coolers if necessary.

Step I Cont.	Parts
(b)	
Tung Oil	10.00
Oil Reactive phenolic resin	0.40
Phthalic anhydride	33.99

Add 3% Xylol under reflux conditions and react at 220°C maximum until an acid number of 40 is reached. Cool to 190°C. Viscosity, Gardner M at 50% non-volatile in mineral spirits should be obtained at this point but do not thin batch.

Step II:

	Parts
Alkyd base—Step I	55.00
Divinyl benzene (50%)	0.26

Add divinyl benzene at 190°C and hold for 15 minutes under reflux, cool to 170°C and add:

	Parts
Vinyl Toluene	10.74
Styrene monomer	34.00

Continue cooling to 100°C and add:

Cumene hydroperoxide (78%)	5.50

Raise temperature slowly to 135-140°C under reflux. This reaction is exothermic and care is required at this point to prevent an uncontrolled reaction. When this temperature is reached, heating can continue to a maximum temperature of 220°C. Hold at this temperature until a W-X viscosity at 60% non-volatile in xylene is reached.

A vigorous inert sparge is then turned on. When most of the unreacted monomer distills over, sparge is reduced and vacuum put on the kettle and lowered slowly to 125 mm. pressure. When all distillate is over, break vacuum with inert gas and thin.

Final Specifications:

Viscosity, Gardner	Z_1-Z_8
Acid Value	3-8
Color, Gardner	5-8
Wt. per gal. pounds	8.35-8.45
Non-volatile percent	59-61
Solvent	Xylol plus a little Toluol

A method for making a mineral spirits soluble styrenated alkyd is outlined in the Table X.

This laboratory believes the tung oil migrates through the chalk and binds the loose particles to the firm substrate, creating a firm surface for the emulsion paint.

The best method for making emulsifiable tung oil and a suggested procedure for adding to a PVA paint are listed in Table XI.

Suggested Procedure for Adding Emulsifiable Tung Oil to Water, Pigment and PVA Emulsion.

1. Add the required amount of water (and water-softening agent, if used) to a mixing tank fitted with a high speed agitator (Cowles, Hockmeyer or equivalent.).
2. Maintain strong agitation throughout. Slowly add the required amount of Emulsifiable Tung Oil to the water.
3. Add wetting and dispersing agents as required.

Table X: Preparation of Styrenated Alkyd, Mineral Spirits Soluble.

	Parts
Alkyd Base (Step I, Table IX)	59.50
Divinyl benzene (50%)	0.29

Add divinyl benzene at 190°C and hold 15 minutes. Cool to 170°C and add:

	Parts
Vinyl Toluene	7.73
Styrene monomer	32.50

Cool to 100°C and add:

Cumene hydroperoxide (78%)	5.75

An exothermic reaction also takes place after addition of the hydroperoxide and the batch is heated with care to 135-140°C under reflux. When the exothermic reaction is completed, the temperature is then raised to 220°C maximum and held for X viscosity at 50% non-volatile in mineral spirits. Inert sparge and vacuum procedure is then followed as outlined in Table X.

Final Specifications:

Viscosity, Gardner	Z_3-Z
Acid Value	3-8
Color, Gardner	5-8
Wt. per gal., pounds	7.75-7.85
Non-volatile, percent	49-51
Solvent	High K B Mineral Spirits

Table XI: Preparation of Emulsifiable Tung Oil and Addition to a PVA Paint.

(Revised 3/31/60)

Material	Pounds	Gallons
Tung Oil	714	91.39
Tergitol NPX (1)	62	7.07
24% Lead Naph. (2)	11	1.14
6% Cobalt Naph. (2)	3.5	.04
Totals	790.50	100.04

(1) Supplied by Union Carbide Chemical Co. Tergitol is a registered trademark of Union Carbide Chemical Co.

This emulsifying agent has been used successfully. Other similar nonionic emulsifying agents will probably work satisfactorily but should be tested in the laboratory before using.

(2) Naphthenates have been successfully used. Water soluble metallic driers also show considerable promise. Mildewcides should be added when indicated.

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4. Add the pigment slowly with strong agitation, following accepted good grinding practices for these machines.
5. Add the protective colloids, other additives and water let-down as required. Maintain agitation for 15 minutes.
6. Add PVA with agitation.

Acrylates are handled in the same way as the PVA type.

Future work to be carried out by this laboratory along these lines will cover butadiene-styrene type emulsion paint on old surfaces of the casein and water soluble glue type.

Varnishes

Cooking varnishes in open kettles has practically disappeared in the United States but there are a number of portable closed kettles of 500-600 gallons capacity in use. They have removable tops for easy cleaning, efficient agitators and a source of inert gas. These kettles are highly versatile and any varnish or alkyd that can be made by the fusion method can be successfully produced in these kettles. Although production usually is not as high as the stationary closed kettle systems because of smaller capacity, capital investment is considerably less.

The closed portable kettles should be equipped with automatic temperature controllers. Power source for the agitator,

Table XII: Formulations, Final Analysis and Cooking Logs for Short Oil Varnishes.

	Label		Furn. Rubbing		Can Lining		Hwy. Marking	
	Lbs.	Gals.	Lbs.	Gals.	Lbs.	Gals.	Lbs.	Gals.
CODE	A-7.5a		A-10		A-15		A-15c	
OIL LENGTH	7.5 gal.		10 gal.		15 gal.		15 gal.	
Phenolic, Oil Reactive	—	—	—	—	180	20.29	—	—
Mod. Phenolic, non-reactive	220	24.05	211	23.00	—	—	165	18.13
Tung Oil	130	16.52	165	21.00	212	26.94	120	15.20
Linseed Oil, Z Visc.	—	—	—	—	—	—	80(a)	9.88
Total Charge	350	40.57	376	44.00	392	47.23	365	43.21
Yield, non-vola.	342	39.64	361	42.24	383	46.14	361	42.73
Mineral Spirits	346	52.95	361	55.26	359	54.96	—	—
VM&P Naptha	—	—	—	—	—	—	361	59.31
Cobalt Napthenate	0.9	.11	1.1	.13	1.4	.17	(b)	(b)
Zirconium Napthenate	2.2	.30	2.8	.39	3.5	.50	(b)	(b)
Anti-skinning agent	1.5	.19	1.7	.22	1.8	.24	(b)	(b)
Total Yield:	692.6	93.19	727.6	98.24	748.7	102.01	722	102.04
Cooking Logs:								
Up-Heat time	1 hr.		1 hr.		1 hr.		1 hr.	
Top temperature	240°C		240°C		240°C		270°C	
Hold at top temp.	25 min.		45 min.		5 min.		45 min.	
Chill to	—		—		—		240°C	
Reduce to non-volatile	50%		50%		51.6%		50%	
Final Analysis:								
Color, Gardner	10		10		11		11	
Viscosity, Gardner	B-C		E		J		A	
Acid number	2.5		2.9		3.6		3.4	
Lbs. per Gallon	7.4		7.4		7.5		7.1	
Yield, non-volatile %	97.7		96.0		97.7		98.9	

(a) ½ held back for chilling.
(b) Added to paint as a part of let-down after grinding. No tests were made on varnish.
The Highway marking paint varnish meets Federal Specification TT-P-115a for white or yellow.

Table XIII: Formulations, Final Analysis and Cooking Logs for Medium Oil Varnishes: 25 gallon oil length.

	CODE Z-74		CODE Z-15		CODE G-1083		CODE A-25a	
	Lbs.	Gals.	Lbs.	Gals.	Lbs.	Gals.	Lbs.	Gals.
Pure Phenolic:								
Oil Reactive	—	—	—	—	125	13.64	—	—
Inactive	52	5.14	125	13.89	—	—	—	—
PE Ester Gum	—	—	—	—	—	—	125*	11.38
Tung Oil	256	32.56	250	31.80	250	31.80	250	31.80
Total Charge	386	46.22	375	45.69	375	45.44	375	43.18
Yield non-volatile	377	44.97	367	44.68	368	44.85	372	42.83
Mineral Spirits	377	58.06	367	56.52	368	56.67	372	57.29
Cobalt Napthenate	1.3	.16	1.3	.16	1.3	.16	1.7	.20
Lead Napthenate	3.2	.32	3.1	.31	3.1	.31	—	—
Zirconium Napthenate	—	—	—	—	—	—	4.2	.59
Anti-skinning agent	2.0	.27	2.0	.27	2.0	.27	2.0	.27
Total Yield	760.5	103.78	740.4	101.94	742.4	102.26	751.9	101.18
Cooking Logs:								
Up Heat time	45 min.		1 hr.		1 hr.		1 hr.	
Top temperature	240°C		240°C		240°C		270°C	
Hold at top temp.	25 min.		40 min.		1 hr.		5 min.	
Chill to	—		—		—		240°C	
Reduce to non-volatile %	50%		50%		50%		50%	
Final Analysis:								
Color, Gardner	8-9		9-10		9		8	
Viscosity, Gardner	I-J		I-J		I-J		I	
Acid Number	12.0		5.5		6.9		3.3	
Lbs. per gallon	7.4		7.4		7.4		7.4	
Yield, non-volatile, %	97.3		97.8		98.1		99.2	

*Hold back 1/3 for chill back.

Table XIV: Short Oil Varnish Test Results.

	Label	Furn. Rubbing	Can Lining
Code	A-7.5a	A-10	A-15
Oil Length	7.5 gal.	10 gal.	15 gal.
Drying Time (Air)			
To touch	3 hrs.	2¾ hrs.	4 hrs.
Lint free	4¼ hrs.	3¼ hrs.	4½ hrs.
Tack free	5 hrs.	3¾ hrs.	5 hrs.
Full Hardness	overnight	overnight	overnight
Sward Hardness (6 mil wet film)			
24 hours	4	4	4
48 hours	8	6	4
72 hours	8	8	8
7 days	14	10	10
Water Resistance (Distilled):			
Exposure 120 hrs.			
To haze	none	120 hrs. (a)	48 hrs.
To blister	none	120 hrs. (a)	none
To whiten	none	none	120 hrs.
To recover	—	15 min.	15 min.
Alkali Resistance (3% NaOH)			
Exposure 96 hrs.			
To haze	none	none	none
To blister	none	none	none
To whiten	none	none	none
To recover	peeled	none	peeled
Soap Resistance (2% Washing Powder)			
Exposure 120 hours.			
To haze	none	120 hrs. (a)	44 hrs.
To blister	none	none	none
To whiten	none	none	120 hrs.
To recover	—	15 min.	No rec.
Acid Resistance (3% Acetic acid)			
Exposure 72 hrs.			
To haze	none	none	24 hrs. (a)
To blister	72 hrs.	72 hrs. (a)	72 hrs. (a)
To whiten	none	none	none
To recover	No rec.	No rec.	No rec.
Grease Resistance (Bacon Grease)			
Exposure 120 hours			
Effect	none	none	none
Saturated Salt Soln. Resistance			
Exposure 120 hrs.			
Effect	none	none	none
Gas Checking (Bell Jar)	passes	passes	passes
Flexibility			
⅛" Mandrel	Failed	Failed	Passed
½" Mandrel	Failed	Passed	Passed
Skinning (6 days)	none	none	none
Impact Resistance (120 lb .)	Failed	Failed	Failed
Abrasion Coefficient (Film Dry 72 hrs.)			
Tabor	119.00	109.00	98.50
Adhesion (Scratch with knife)	Good ribbon tough	Good ribbon tough	Good ribbon tough

(a) Light
(b) Moderate
(c) Heavy

inert gas line and temperature recorder should be easily disconnected. In a highly efficient system, a packed column equivalent to 5-6 plates, should be used between the kettle and fume burner or condenser and the top of the column should be equipped with water cooling coils to control the over-pass temperature. Polyhydric alcohol and phthalic anhydride losses can be reduced substantially with this equipment.

There are a number of applications such as floor and marine varnishes, porch and deck enamels and machine coatings that require tung oil varnishes for superior performance and the kettle system described above is highly efficient for making either varnishes or alkyds containing tung oil.

Although most experienced formulators are familiar with the following varnish formulations, this information should be useful as a ready reference. In addition, the many detailed tests included for each varnish are not generally available in the literature and are designed as a guide and for determining the best formulation for special requirements.

Varnish Formulations

Varnishes were formulated in this laboratory and cooked in open varnish kettles. As a result, colors of the finished varnishes are darker than when made in closed systems described above. ASTM methods of test were utilized where such methods are in effect.

Table XV: Medium Oil Varnish Test Results.

	Z-74	Z-15	G-1083	A-25a
Drying Time (Air)				
To touch	1½ hrs.	1¾ hrs.	1¾ hrs.	4¼ hrs.
Lint free	1¾ hrs.	2¾ hrs.	4 hrs.	6¾ hrs.
Tack free	2¾ hrs.	3¾ hrs.	4¼ hrs.	7 hrs.
Full hardness	overnight	overnight	overnight	53 hrs.
Sward Hardness (6 mil wet film)				
24 hours	4	2	2	2
48 hours	4	2	2	2
72 hours	4	4	4	4
7 days	6	6	6	4
Water Resistance (Distilled)				
Exposure 120 hrs.				
To haze	none	48 hrs. (a)	72 hrs. (a)	48 hrs. (a)
To blister	none	none	none	120 hrs. (a)
To whiten	none	none	none	none
To recover	—	15 min.	15 min.	15 min.
Alkali Resistance (3%NaOH)				
Exposure 96 hours.				
To haze	none	none	none	none
To blister	none	none	96 hrs.	96 hrs.
To whiten	none	none	none	none
To recover	none	peeled	peeled	peeled
Soap Resistance (2% Washing Powder)				
Exposure 120 hrs.				
To haze	120 hrs. (a)	120 hrs. (a)	93 hrs. (b)	120 hrs. (a)
To blister	none	none	none	72 hrs. (a)
To whiten	none	none	none	none
To recover	5 min.	5 min.	30 min.	30 min.
Acid Resistance (3% Acetic acid)				
96 hrs. exposure				
To haze	none	none	none	none
To blister	96 hrs. (v)	48 hrs. (b)	48 hrs. (b)	48 hrs. (a)
To whiten	none	none	none	none
To recover	peeled	peeled	mod. peel	no rec.
Grease Resistance (Bacon Grease)				
Exposure 120 hours.				
Effect	none	none	none	none
Saturated Salt Soln.				
Exposure 120 hours				
Effect	none	none	none	none
Gas Checking, (Bell Jar)	passes	passes	passes	passes
Flexibility:				
1/8" Mandrel	passes	passes	passes	passes
Skinning	overnight*	overnight*	overnight*	72 hrs.
Impact Resistance				
(120 lbs.)	passes	passes	passes	passes
Abrasion Coefficient (Film Dry 72 hrs.)	41.0	5.0	20.5	46.00
Adhesion (Scratch with knife)	Good ribbon Tough	Good ribbon Tough	Good ribbon Tough	Good ribbon Tough

(a) Light
(b) Moderate
* Anti-skinning agent not used.

Short Oil Varnishes

These varnishes are used where very fast dry and special requirements, such as resistance to grease, are primary considerations and a more brittle film can be tolerated. They are used for purposes such as label varnishes, can linings, furniture rubbing varnishes, highway marking paints and industrial clear finishes.

The Highway marking paint varnish meets Federal Specifications TT-P-115a for white or yellow (Table XIV).

Medium Oil Varnishes

These varnishes are the most popular and are used for many purposes such as floor varnishes, architectural paints, exterior application, machine primers, enamels and general use.

Several of these varnishes formulated and tested in this laboratory are listed in Table XIII.

Varnish Code Z-74 is a general purpose varnish that gives very good performance but is not as expensive as the varnish made with pure phenolic. This varnish can be used for flooring, machine primers and porch and deck enamels.

An example of a top grade non-reactive pure phenolic is

Table XVI: Formulations, Final Analysis and Cooking Logs for Long Oil Varnishes.

	Enamel Undercoater		Exterior Spar		Aluminum Liquid	
	Pounds	Gallons	Pound	Gallons	Pounds	Gallons
Code	A-5b		A-2b		A-60d	
Oil Length	30 gal.		40 gal.		60 gal.	
Pure Phenolic:						
Oil reactive	6	.65	15	1.63	18	1.96
Modified Phenolic	114	12.45	85	9.27	—	—
Petroleum Resin	—	—	—	—	42	4.54
Tung Oil	278	29.80	228	24.44	215	23.05
Bodied Soybean Oil, Z viscosity	—	—	—	—	73	9.10
Linseed Oil, Q Visc.	—	—	78*	10.12	—	—
Total Charge	398	42.90	406	45.46	348	38.65
Yield, non-volatile	393	42.34	390	43.64	343	38.11
Mineral Spirits	393	60.52	378	58.21	384	59.14
Cobalt Napthenate	1.4	.17	1.5	.18	1.5	.18
Calcium Napthenate	—	—	—	—	1.5	.18
Lead Napthenate	3.5	.36	5.1	.52	6.0	.61
Anti-skinning agent	1.7	.23	1.0	.13	1.7	.23
Total Yield	792.6	103.62	775.6	102.68	737.7	98.45
Cooking Logs:						
Up-heat time	1 hr.		30 min.		1 hr.	
Top temperature	240°C		275°C		240°C	
Hold at top temp.	25 min.		5 min.		40 min.	
Chill to	—		240°C		—	
Reduce to non-volatile, %	50.0		50.8		47	
Final Analysis:						
Color, Gardner	8		8-9		11	
Viscosity, Gardner	D		G-H		D-E	
Acid number	4.4		3.6		2.8	
Lbs. per gallon	7.5		7.4		7.3	
Yield, non-volatile	98.7		96.0		98.6	

*Held back for chilling.

demonstrated by varnish Code Z-15 and are excellent general purpose varnishes.

The best grade varnishes for durability and resistance are those made with Tung Oil and pure phenolic of the heat reactive type. Code G-1083 is an example of this varnish.

Where yellowing is not a serious problem, best results are obtained with the phenolics. However, there are requirements for varnishes more resistant to yellowing. For a varnish to give good performance on yellowing a different type of resin must be used. Ester gums or maleinized ester gums are suitable for this purpose. In this class, PE ester gum is lowest cost and will perform satisfactorily for the purpose. However, some durability will be lost.

Formulation Code A-25a is an example of this type.

Test results in the medium oil range are reported in Table XV.

Long Oil Varnishes

The long oil varnishes find applications as marine spar varnishes, exterior use on wood and metal and for primer and finish coats on steel structures, and aluminum liquids and enamel undercoaters.

A few examples of these type formulas are shown below.

Test results with the above varnishes are reported in Table XVII. These varnishes are especially effective for exterior purposes including under-water salt water exposure.

Varnishes based on tung oil and resin will supply very good performance for a wide number of applications at reasonable cost. They are easy to produce and do not require heavy capital investment for equipment. Raw materials are readily available and are highly uniform in character.

Conclusions

The use of Tung Oil in coatings provides many advantages not otherwise obtainable. Plant efficiency can be substantially improved. Finished alkyd paints made with Tung Oil have faster dry and better durability.

The addition of emulsifiable tung oil to water thinnable paints makes it possible to use these paints successfully on chalky surfaces. It is effective over a wide range of chalking conditions, penetrating to the firm substrate and binding the chalk particles together to make a firm surface.

Tung oil in the manufacture of styrenated alkyds is an important reagent to limit growth of the polystyrene molecules and produce a more uniform polymer.

The use of tung oil and its characteristics in varnishes are well known.

The Pan American Tung Research and Development League is expanding its facilities to better serve the coatings and other industries and with the basic research and development work now underway at its own laboratories and affiliate in Buenos Aires, Argentina, Fellowship grants and the Southern Regional Research and Development Division of the USDA, new products, processes and basic information can be expected to develop.

We extend a cordial invitation to the coatings and other industries to contact us for discussions on problems of mutual interest.

Table XVII: Long Oil Varnish Test Results.

	Enamel Undercoater	Exterior Spar	Aluminum Liquid
Drying time (Air)			
To touch	2½ hrs.	3½ hrs.	2 hrs.
Lint free	4 hours	5¼ hrs.	3½ hrs.
Tack free	4½ hrs.	5¾ hrs.	4 hrs.
Full hardness	Overnight	Overnight	4½ hrs.
Sward Hardness (6 mil. wet film)			
24 hours	2	2	2
48 hours	4	2	2
72 hours	4	2	2
7 days	4	2	4
Water Resistance (Distilled)			
Exposure 120 hours			
To haze	120 hrs. (a)	120 hrs. (a)	none
To blister	none	none	none
To whiten	none	none	none
To recover	5 min.	5 min.	none
Alkali Resistance (3% NaOH)			
Exposure 96 hrs.			
To haze	none	none	none
To blister	none	none	24 hrs.
To whiten	none	none	—
To recover	peeled	—	peeled
Soap Resistance (2% Washing Powder) Exposure 120 hrs.			
To haze	120 hrs. (b)	none	120 hrs. (a)
To blister	none	none	none
To whiten	none	none	none
To recover	15 min.	—	5 min.
Acid Resistance (3% Acetic acid)			
Exposure 96 hrs.			
To haze	none	none	48 hrs.
To blister	96 hrs.	none	48 hrs.
To whiten	none	none	none
To recover	no rec.	—	no rec.
Grease Resistance (Bacon Grease) Exposure 120 hrs.			
Effect	none	none	none
Saturated Salt Solution Exposure 120 hrs.			
Effect	none	none	none
Gas Checking (Bell Jar)	*	passes	*
Flexibility, 1/8" Mandrel	passes	passes	passes
Skinning	none (7 days)	144 hrs. (b)	48 hrs
Impact Resistance (120 lbs)	passes	passes	passes
Abrasion Coefficient (Film Dry 72 hrs.)			
Tabor Abrasion Meter	69.0	21.0	39.0
Adhesion (Scratch with knife)	Good ribbon Tough	Good ribbon Tough	Good ribbon Tough

(a) faint
(b) light
(c) moderate

*Note: These varnishes have a tendency to gas check in foul air but they can be cooked at 270°C or by adding 10% oil reactive pure phenolic on weight of tung oil and eliminate this characteristic. It has also been reported that very small quantities of tertiary butyl hydroperoxide is effective and permits cooking at lower temperatures.

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Acknowledgement

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Dow Corning Resin Number and Type	Percent Solids: Solvent Type	Viscosity, Gardner-Holdt	Viscosity, Centipoises	Color, Gardner	Pounds Per Gal.	Flexibility*	Hardness*	Craze Life, Hr. At 250 C	Thermoplasticity*	Leafing*	Service Temp., °F, Colored	Service Temp., °F, Aluminum	Weatherability*	Gloss Retention*	Application
804 Silicone	60 Toluene	A-3 to A	20-40	2	8.8	3	8	100	8	9	400	600	1	10	Blending Resin
805 Silicone	50 Xylene	C-F	80-150	2	8.4	10	3	8000	3	7	550	1000	10	3	Vehicle for Aluminum Paints
806A Silicone	50 Toluene	D-H	100-200	1	8.5	5	8	2500	7	3	500	1000	5	10	Vehicle for High Gloss Enamels
808 Silicone	50 Xylene	F-J	150-250	2	8.4	9	6	5000	4	6	550	1000	10	10	Vehicle for High Gloss Enamels
840 Silicone	60 Toluene	A-1 to A-3	15-25	2	8.8	5	7	900	7	9	450	800	5	9	Blending Resin
R-60031 Silicone-alkyd Copolymer	50 Cellosolve Acetate, Toluene	D-L	100-300	4	8.8	10	10	500	10	10	450	600	10	10	Vehicle for Appliance, Exterior Enamels (Baking Type)
XR-60032† Silicone-alkyd Copolymer	60 Mineral Spirits	V-Y	750-1500	6	7.8	10	9	100	9	3	400	800	10	9	Vehicle for Maintenance Paints (Air Dry)

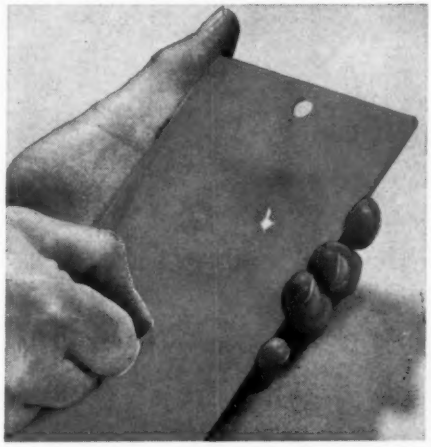
* Relative Comparison: 1 = very poor; 10 = excellent. † Available in trial samples only.

For more durable coatings formulate with silicone resins

Start your formulation with these Dow Corning resins and copolymers and you're sure to produce finishes that last longer, cut maintenance costs, assure user satisfaction. You can even pre-determine the degree of heat stability, weather resistance, gloss retention, or other properties needed to meet the requirements of specific applications.

In maintenance coatings where heat may be a problem, Dow Corning 805 and 806A Resins provide lasting resistance to 1000 F when blended in aluminum formulations. Such paints are excellent for use on stacks, mufflers, boilers, jet engines, exhaust manifolds and other hot spots. Where painted areas must maintain color at temperatures up to 550 F, your choice should be 808 Resin. You'll find coatings made with 808 Resin resist fading and chalking . . . lengthen the time between repaintings. And if you're interested in air-drying silicone organic copolymers, note that Dow Corning also offers silicone intermediates . . . you can enjoy the economies of cooking your own vehicles.

Product finishes, too, are better when you start with silicones. In this field, Dow Corning R-60031 silicone-alkyd copolymer helps in formulating decorative finishes that hold color and adhere well at surface temperatures as high as 450 F. Finishes made with this copolymer are ideal for space heaters, clothes driers, stoves, other hot appliances. When temperatures



rise to 550 F, Dow Corning 804 and 808 Resins are recommended.

You make better finishes when you start with the Dow Corning silicone resins and copolymers listed above. For more specific information, write Dept. 6513.

Your best source for information about silicone resins, intermediates, and paint additives is the Dow Corning office nearest you.

first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.

The DRAIS-LEHMANN PLANETARY MIXER

features high production with low maintenance

Drais-Lehmann Planetary Mixer, showing stirrer unit in raised position

The DRAIS-LEHMANN PLANETARY MIXING and KNEADING MACHINE is designed for rapid stirring, mixing and kneading of viscous materials. This unit incorporates every technical advance for increasing output with relatively low maintenance cost.

A new type quick locking and releasing device for the tank and use of several mixing tanks permit practically continuous production. This provides distinct advantages when stirring into a paste; diluting, coloring, pre-mixing and homogenizing paints, lacquers, printing inks, plastic pastes, pharmaceutical and cosmetic materials, foodstuffs, beverages, etc.

The Mixer functions on the planetary principle with two agitators turning along the tank wall and simultaneously rotating at a higher speed around their own axes. The stirring mechanism has mixing blades of opposed, staggered spiral arrangement (see photograph); a rod type stirrer or a special agitator—according to the material processed. The machine is available in several types, power specifications and metals, including stainless steel.

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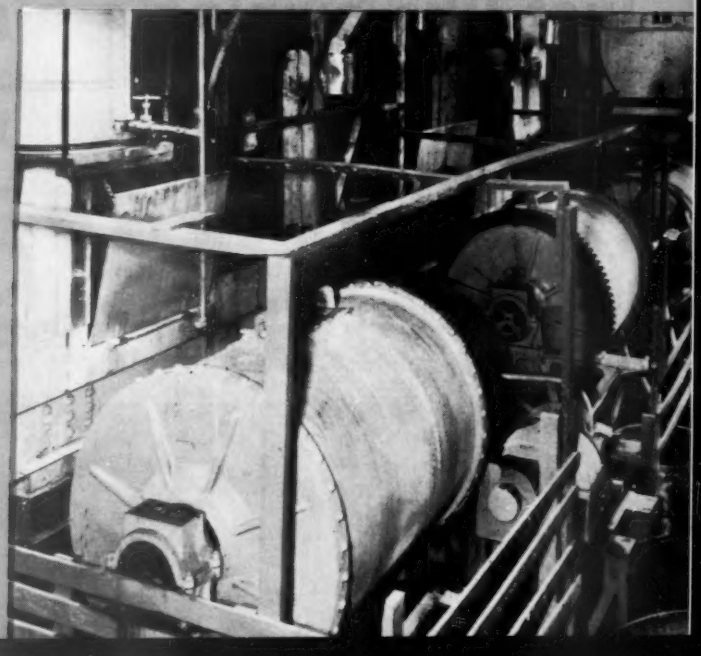
PRODUCTION

PACKAGING

MATERIAL HANDLING

NEW EQUIPMENT and MATERIALS

In this pebble mill grinding operation, one mill load was required in place of two to produce a 1400 gallon batch. Grinding time was reduced from 40 hours to 16 using cylindrical high density media. For details, see page 73.



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Expand output without expanding your plant. Celanese Formcel Solutions permit larger batch sizes of urea/melamine-formaldehyde resins than are possible with 37% Formalin solutions. Dehydration is reduced or eliminated . . . operating and labor costs are lowered.

Investigate these cost-saving Celanese Formcel Solutions in urea, ethylene urea, melamine and triazone-formaldehyde resin production, or as organic chemical intermediates. The five solutions listed below are available in tankcar, tank-truck, or drum quantities.

For prices and technical data, write to: Celanese Chemical Company, Dept. 558A, 180 Madison Avenue, New York 16.

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*FORMALDEHYDE IN ALCOHOLS

METHYL 46.5% HCHO
METHYL 55% HCHO
ISO-BUTYL 40% HCHO
n-BUTYL 40% HCHO
n-PROPYL 40% HCHO

Celanese CHEMICALS

HIGH DENSITY GRINDING MEDIA

This new tool can increase efficiency of the pebble mill while utilizing existing equipment.

By
R. C. Mulligan*

WITH the development of new processing methods for paint grinding or dispersion, the paint manufacturer is forced to a decision in order to stay competitive: Accept the new methods as they are introduced or continue with and improve where possible the tried and proven workhorses, such as the pebble mill. If the new methods are accepted, the old equipment is no longer needed and will probably be disposed of to help cover the cost of the new equipment. Such a change could still, however, amount to quite a capital investment.

Before such a decision is made it may prove wise to consider a factor that could perhaps change the entire picture: High Density Grinding Media. This new tool can increase efficiency of the pebble mill while utilizing existing equipment. With the addition of the High Density Grinding Media, it is possible to employ present pebble mill equipment and produce paint by what is reported to be one of the lowest cost production methods. Furthermore, all grades of paint can be processed with little or no variation in present formulation.

*Sales Engineer, Diamonite Products Manufacturing Co., Shreve, Ohio.

Composition

A composite of Al_2O_3 crystals, the laboratory originated, High Density Grinding Media is available in cylindrical grinding shapes as well as spherical and natural shapes. Two characteristics make these high density mediae more productive than lighter weight materials: (a) Higher density as its name implies and, (b) the wear resistant qualities of this material. The alumina oxide segments have an average density of 3.5 compared to 2.6 for the natural flintstones; affording the production man the opportunity to utilize a more viscose mill charge. As a result an increased quantity of finished paint and an improved dispersion of the harder grind pigments can be achieved.

Natural Flint Pebbles

Hardness 6.5—7.0 Mohs
Specific Gravity 2.4—2.5 Grams per Cubic Centimeter

Aluminum Oxide

Hardness—9 Mohs: Rockwell A. 89-92; N-45
Specific Gravity—3.5 + grams per cubic centimeter
Modulus of Rupture—Over 50,000 lbs. per square inch
Compression Strength—Over 500,000 lbs. per square inch

The high density grinding media is composed of fine grain high purity aluminum oxide crystals held together by an almost indestructible bond and vitrified by various high temperature processes. With a hardness measure of 9+ on the Mohs scale it offers the highest wear resistance of any material employed in grinding service. The high density media has a dense uniform structure that is impervious to moisture, chemically inert, noncorrosive, non-oxidizing, and is resistant to most acids and alkali. The media is easily cleaned as it has a smooth surface free from cracks, voids, and rough areas.

Table I. Comparative Specific Gravity of Materials Used in Grinding Media

	Grams per cubic centimeter
Porcelain	2.40
Natural Flint Stone	2.60
Aluminum Oxide (Diamonite)	3.65
Steel	7 75

Grinding Efficiency

With a specific gravity of more than 3.5 grams per cubic centimeter there is no tendency to float even in the heavy pasty latex. This gravity is 50% greater than that of porcelain but less than half that of steel. Actual production experience indicates high grinding efficiency with a 25% or more reduction in the grinding cycle when compared with the lighter materials. Because of its high wear resistance it loses volume very slowly as indicated by Figure 1 showing the cylindrical rods after more than 17,000 hours of service, grinding industrial enamels.

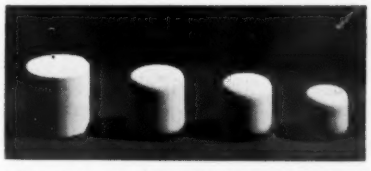


Figure 1. (Left) cylindrical grinding rod as formed—13/16" diameter x 13/16" long; followed by pretested rod with edges radiused—ready to ship. (3rd from left) after eighteen months grinding latex four hours a day, six days a week, volume loss 10%, and (far right) after an additional 31 months grinding enamels 120 hours a week, total volume loss 37%. Note that original cylindrical shapes is retained after 49 months service.

In a case history of a company where increased production and lower cost was a must, the following

facts have been observed over a year's testing program: The sales on products produced in pebble mills were expanding faster than the production of these products. It was decided to review the entire program in seeking a possible solution. One avenue of approach was to investigate the various types of high density grinding media produced from the Al_2O_3 crystals. That testing program is the basis of this article.

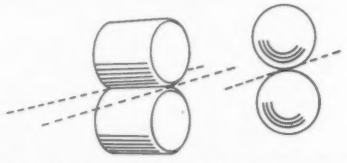
Testing

A small 15" x 21" ball mill was set up for preliminary testing under controlled conditions. This testing narrowed the field down to two particular shapes and sizes. A cylindrical rod 13/16 x 13/16 and a flattened sphere 7/8 x 1¼, both of the Al_2O_3 material. These mediae were selected with the principle thought in mind that a shear action rather than an impact grinding action would be more desirable, considering the type of pigments and extenders normally dispersed in the mills.

In the semi-production mill test with the high density grinding media, a viscosity formula was found for the pebble mill products of between 100 and 120 Kreb Units at mill temperature. This viscosity gave the finest grind in the least amount of hours. The vehicle solids should remain low, approximately 10%. However, as the tests at this stage were not final, this consistancy change was not attempted and viscosities were kept at the flint pebble level of 65 to 70 KU.

After semi-production mill tests were completed, media was purchased to charge a 6' x 5' pebble mill with a buhrstone lining. The mill was not equipped with lifter bars and has a speed of 16 RPM which is approximately 65% of the ideal speed suggested with the use of the high density media. As the horsepower was only 15, in lieu of the suggested minimum of 20 when using high density media, it was necessary to hold the media charge to 40% by volume. This actually proved advantageous as the lower media charge allowed a greater base load with no adverse affects on the batch turnover. Ideal results were secured in a given 24 hour cycle.

In a total of 1,317 running hours using the cylindrical rods, 62,500 gallons of finished enamel were produced averaging 47 gallons per mill hour. Replacing the rods with the natural shaped media resulted in 32,000 gallons in 800 hours of operation, an average of 40.5 gallons per mill hour. The majority of these batches were actually too thin for the high density grinding media and a high media loss did result. These batches were identical in formulation as those run in the past with flint pebbles. The normal results with the flint pebbles was an average of 21.6 gallons per mill hour.



Cylindrical media, rolling over each other, present a plane of contact while spheres in motion afford only line contact.

13/16-inch diameter x 13/16-inch long cylindrical media present 2.0759 square inches of cylindrical supporting area when half immersed. A 13/16-inch diameter sphere, weighing one third less, presents the same supporting area when half immersed.

The cylindrical rods had a slightly higher loss factor than did the natural shaped media, but the rods out produced the spherical shaped media by approximately 17%. It is believed that these differences can be partially attributed to the fact that selectivity could not be excercised, that is the types of products (as to their viscosity), quality, and the number of batches ran in each could not be controlled as production schedules had to be met, and a large mill could not be set aside for test purposes only. The rods, however, did prove superior in grinding speed over the other shaped media, which can possibly be explained by the 25% less volume of voids.

Later in the testing another mill of the same type used only on six more popular lines was utilized to obtain more specific details in comparing the various media. Using the flint pebbles, a 5,600 pound 50% charge gave an average of 18.6 gallons per mill hour with only a 168 pound media weight loss in 1633 hours. (See Chart A). The round surfaced high density media charge of 6,500 pounds, 45% by volume, produced an average of 37.8 gallons per mill hour, with a weight loss of 493 pounds in 520 hours. (See Chart B). The other high density media, cylindrical shapes, brought the average gallon per mill hour up to 44.7 with a media charge of 6,500 pounds by 40% volume. The weight loss, however, here totalled to 789 pounds in 668 hours. (See Chart C). The supplier of this media claims the initial wear to be high due to the further radiusing of the rods when first used and that the wear factor decreases after its initial usage.

It is the writer's opinion that the media losses encountered in the following tests were high for all three media employed. It is probable that this high loss occurred as a middle road was taken: The viscosities were not changed or controlled and varied from one batch to the next; while the vehicle solids were maintained at approximately 10%.

As the testing progressed, several formulas were changed to secure the ideal Kreb Unit reading of 100-120. In producing 199,000 gallons with a running time of 4,300 hours, the media loss dropped to only 7 pounds per 1,000 gallons, while producing 47 plus gallons per mill hour, indicating a substantial savings of media is possible while using the correct viscosity, perhaps also illustrating a fact pointed out by the supplier that the wear decreases after the rods have been used. The wear dropped from about 12% to less than 7%. It is also believed that the mill lining life was prolonged.

It was found that the cylindrical design, in addition to the higher density and wear resistant qualities mentioned above, affords maximum contact area greatly increasing grinding speed. The shape affords a plane of contact between units in motion compared with line contact offered by spherical and similar forms. This, of course, is theoretical but an important factor as observation in mills equipped with transparent ends have shown that an average of 25% of the rods in a charge are in contact with axis parallel. This observation also showed that the total contact area

DATA FOR PEBBLE MILL MEDIA

Chart A

Mill: 6 x 5 Buhrstone Lined Media: ¾"—1" Flint Pebbles

Media Data—Wt. 5,600 Lbs. Vol. 50% Wt. Loss 168# Avg. 18.6 Gal. Per Mill Hr.

Code	Batches	Total Hours	Avg. Hrs. Per Batch	Operating Temp. °F	Viscosity Kreb Units	Avg. Production Gal./Hr.
19-310	20	738.0	36.9	—	—	19.0
21-511	6	212.0	35.3	—	—	19.8
52-043	2	86.0	43.0	—	—	16.3
61-010	10	189.0	18.9	—	—	26.5
61-029	4	121.0	30.2	—	—	23.1
A-0591	4	287.0	71.8	—	—	7.0

Chart B

Mill: 6 x 5 Buhrstone Lined Media: ⅞" x 1" Natural Shape (High Density Media)

Media Data—St. 6,500 Lbs. Vol. 45% St. Loss 493# Avg. 37.75 Gal. Per Mill Hr.

Code	Batches	Total Hours	Avg. Hrs. Per Batch	Operating Temp. °F	Viscosity Kreb Units	Avg. Production Gal./Hr.
19-310	9	191.25	16.80	80	100	41.65
21-511	4	61.85	15.44	91	100	45.34
52-043	2	37.50	18.75	132	65	37.33
61-010	2	19.00	9.50	94	71	52.63
61-029	6	101.00	16.83	84	111	41.58
A-0591	2	120.25	60.12	91	103	9.98

Chart C

Mill: 6 x 5 Buhrstone Lined Media: 13/16" Cylindrical Rods (High Density Media)

Media Data—Wt. 6,500 Lbs. Vol. 40% Wt. Loss 78Ⅸ Avg. 44.7 Gal. Per Mill Hr.

Code	Batches	Total Hours	Avg. Hrs. Per Batch	Operating Temp. °F	Viscosity Kreb Units	Avg. Production Gal./Hr.
19-310	16	280.0	17.5	88	89	38.6
21-511	8	116.5	14.6	85	82	48.1
52-043	2	28.8	14.4	124	64	48.7
61-010	10	76.2	7.6	89	86	65.6
61-029	4	63.5	15.9	89	128	44.1
A-0591	4	103.8	25.9	87	107	23.1

throughout the charge was considerably larger. Another feature of the cylindrical design that possibly contributes to its greater grinding efficiency, is the fact that it presents less supporting surface per unit of weight as it comes in contact with the mixture, thus reducing the deceleration at the point. The rods also retained their shape offering the above advantages through the full period of their use.

Cost and Output

The cylindrical high density grinding media although more costly than the flint media used in the tests above proved to cost considerably less per ton of material processed. The decrease in grinding time proved to be the way to meet the increased production demand at a reduced cost without heavy capital investment.

In the past using flint pebbles in producing one particular batch, it was necessary to charge a pebble mill twice to disperse sufficient paste for a 1400 gallon batch. Flint pebbles required an average of 20 hours running time for each mill load. Cylindrical high density media was purchased to load this mill, and used on this same formulation cutting the grinding time to 8 hours each, with a total weight loss of 298 pounds in processing 18 batches. These had an average viscosity of 65 to 69 Kreb Units. By increasing the Kreb Units to 102 at mill temperature it was possible to charge enough paste at one time to produce the 1400 gallon batch in only 16 hours running time. The use of high density media here resulted in more than doubling the output per mill hour and savings of 50% in labor costs were realized. As noted before, the media wear decreased after its initial use. The even wear can also be credited to the increase in the viscosity.

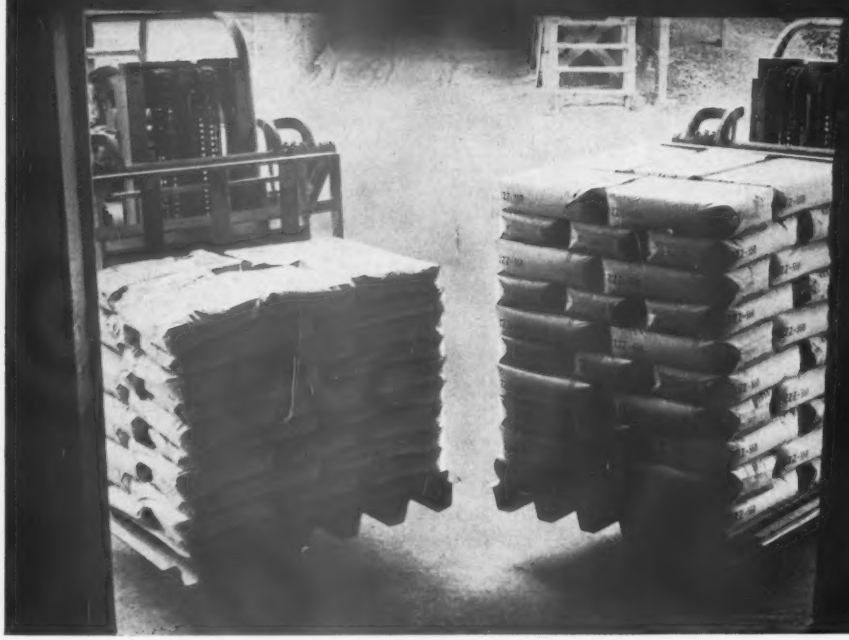
It was found in the testing that several products, formerly ran only on roller mills, could be dispersed satisfactorily in the pebble mill when using high density grinding media. This new process on only four lines has resulted in a savings of over 2,000 direct labor hours the first year alone without any added capital investment in equipment or buildings.

While the above experiments are not final, the evidence gathered is sufficient to prove pebble mill production can be increased greatly by applying the high density grinding technique. This, then, was the decision of only one paint producer but perhaps "Food for Thought" for others.

The author acknowledges the asistance of G. I. Schmidhammer of the Diamonite Products Mfg. Co., in the preparation of this article.

Now you can greatly increase warehouse space* at no increase in cost with...

AZODOX high apparent density zinc oxides



You can store AZODOX in much less warehouse space than required by other zinc oxides. Reason is, you get many more pounds of AZODOX per cubic foot of pigment, up to 65 lbs./cu. ft.! And smaller bags handle easier, faster—stack higher safely—reduce breakage losses—are shaped to give close-packed, unitized shipments.

In the manufacture of AZODOX, an exclusive process removes excess, space-wasting air from between individual particles of zinc oxide. That's all! Actual pigment density and all other desirable properties are unchanged. In comparison with other zinc oxides, high apparent density AZODOX flows freely yet dusts less, increases mixing capacity, disperses readily.

You can get high apparent density AZODOX in five grades of AZO brand lead-free paint pigments: acicular or nodular particle shape. For technical data, just fill in and mail this coupon.

*Pallet load of AZODOX on left above is 30.4 cu. ft. Pallet load of regular zinc oxide on right is 44 cu. ft. Same number of bags; same weight . . . *but a 30 percent saving in space!*

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NEW EQUIPMENT AND MATERIALS

This section is intended to keep our readers informed of new materials and equipment. While every effort is made to include only reputable products, their presence here does not constitute an official endorsement.

McDANEL

BRICK
Long Wearing Lining

New line of super high density alumina tongue-and-groove mill lining brick forms a unitized, longer wearing lining with less "pick-up" from wear.

The new tongue-and-groove mill lining brick are supplied in 1½", 2" and 2½" thicknesses and are 6" long. Straight brick for mill ends, wedge shapes with different tapers for various diameters, special frame brick and door blocks all have the new tongue-and-groove feature. By using the lining brick, it is possible to install thinner linings in larger size mills, thereby increasing the capacity and reducing weight.

The company says that the linings will outwear standard linings approximately three to one, resulting in considerable savings in cost over the life of the lining. The cost of downtime, tearing out old linings and installing new ones is high and based on the three times longer life of the lining, two expensive tear-out and relining jobs are eliminated at a large saving.

The new high density linings are available through Pebble Mill Manufacturers, selected Machinery Reconditioners and Supply Distributors for nearly all sizes of batch and continuous Ball Mills.

McDanel Refractory Porcelain Co., Dept. PVP, Beaver Falls, Pa.

TITRIMETER
Manual and Automatic Models

New titrimeter with greater range, sensitivity, accuracy than before uses standard Beckman elec-

FISHER

trodes; Leeds & Northrup electrodes can be used with an adapter.

The endpoint is indicated by a sensitive null-meter that won't change characteristics with age, is not temperature-sensitive, shows the slightest changes in potential near the endpoint.

A full-wave silicon rectifier converts 115-volt 50/60 cycle a-c into direct current. Zener diodes then supply precisely regulated voltages to a transistorized amplifier which has extremely low drift, negligible electronic "noise."

By means of a selector switch the instrument allows the chemist (always interested in *titration sensitivity*, or how closely he can determine the exact endpoint) to work at *two* sensitivity levels—*one 4 times higher than the other.*

The change in potential at the equivalence point may be abrupt or quite gradual. If abrupt, the titrimeter's low sensitivity setting will assure that each increment of titrant produces only a small meter deflection, prevents running past the endpoint and need to back-titrate. If the endpoint is not sharp, thetitrimeter's sensitivity setting gives optimum meter deflection.

Fisher Scientific Co., Dept. PVP, 717 Forbes Ave., Pittsburgh 19, Pa.

VARIABLE SPEED DRIVE
Four-speed Transmission

New infinitely variable speed drive.

Uses a 1200 RPM motor. Either dripproof or totally enclosed fan-

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cooled units can be furnished, in ½, ¾ or 1 HP,

The incorporation of a four speed transmission as a component

of the drive results in three times greater torque at the low speed than in any comparable friction type unit.

A simple control wheel regulates the output shaft to the desired RPM. A pointer indicates on a calibrated speed plate, the exact RPM at which the output shaft is turning.

Unique design features insure long belt life, and when necessary, belt replacement can easily be made in a matter of minutes.

The new drive is compact and light in weight. Installation is easily made with a minimum of effort.

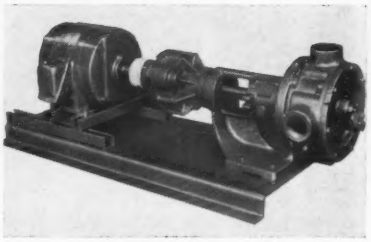
The Lima Electric Motor Co., Inc., Dept. PVP-314, Lima, Ohio.

PHTHALO GREENS
Non Settling

By adding two new colors to its Aurasperse line, company has fanned out its spectrum of phthalo greens — toward the blue with phthalo green W-6012, and toward the yellow with phthalo green W-6014. W-6012 gives unusual blueness, while W-6014 Phthalo Green Extra Yellow presents a shade which cannot be matched economically with any weather stable pigment blend. Both colors feature notable cleanliness. Both are completely non-settling and have excellent storage stability. In addition, they have a comparatively low water solubles content, and prove less costly than comparable products currently available. Each offers an extra margin of tinting strength achieved through the limiting of particle size to a narrow band in the very fine range—the result of a unique manufacturing process which promises more new colors with the same desirable characteristics.

Individually these are better products than can be obtained through blending pigments ordinarily on hand in a factory laboratory. Formulators of industrial aqueous finishes will find their use an advantage in the search for unique colors.

The Harshaw Chemical Co., Dept. PVP, 1945 East 97th St., Cleveland 6, Ohio.



WAYNE

PUMPS
Light Weight

Two new series of internal gear rotary pump assemblies feature integral helical gear reduction assemblies mounted directly to the pump.

Principal advantages cited by the firm include lighter weight and smaller size than conventional outboard spur geared pumping assemblies. Since the gear drives are integral with the pump, misalignment in manufacturing or in field installations or adjustment is impossible.

Capacities range from 26 GPM for the smallest model in either the "CJ" or "DJ" group to 252 GPM for the largest. The pumps are rated up to 100 PSI, and motor

4 Advantages of DAVIES Container Service

1. **Three Plants for Prompt Shipment.** Davies has container plants in Cleveland, Conneaut and Massillon, Ohio.
2. **97 Years Container Experience.** The extensive combined experience of the Davies plants insures reliable quality.
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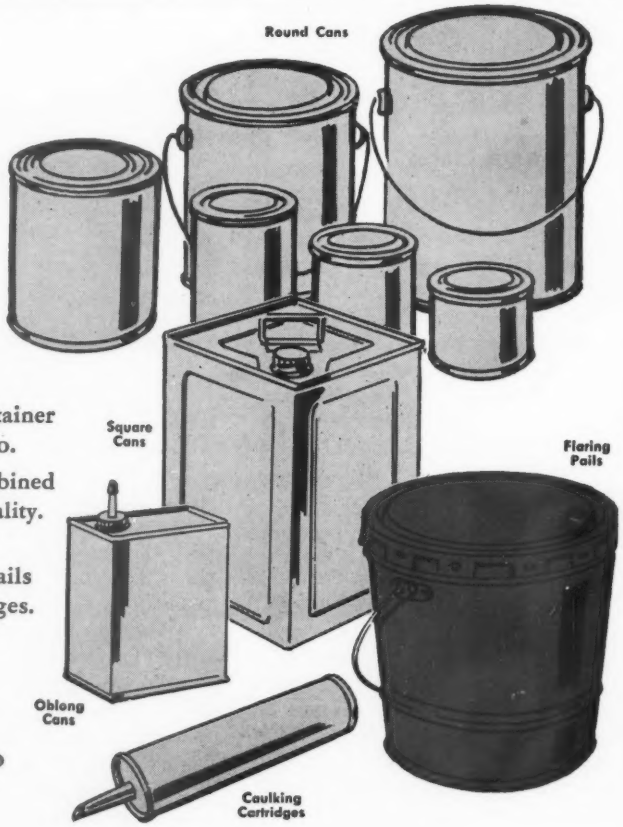
8007 Grand Avenue • Cleveland 4, Ohio



sizes range from 1½ to 10 HP, depending upon the model size and required performance.

The oil-immersed gear drives are AGMA rated, and can be provided for pump speeds of 635, 515 or 420 RPM from standard 1750 RPM motors. Different motors can be substituted with "plug-in" simplicity even under field conditions. Wayne states that the gear drive is rotatable on the pump making it a simple matter to replace original motors with larger or smaller ones for changing applications.

The Wayne Pump Co., Dept. PVP, Griffin St., Fort Wayne, Ind.

UNSATURATED GLYCOL
Two Grades

Unsaturated glycol, until recently more or less a laboratory curiosity, will for the first time become available in tank car quantities, in two grades (Technical and Purified).

New catalytic reduction process has made it feasible to start production of this olefinic glycol on a commercial scale, with availability dates around the first of the year. Further price reductions to the vicinity of 50c per pound of the technical grade butenediol are considered probable at a later date.

"Butenediol" is derived from butynediol, which is produced by condensing acetylene with formaldehyde under pressure at elevated temperatures. Butynediol is then converted into butenediol.

The principal use for butenediol is as a new, versatile building block in organic synthesis. It reacts both as a glycol and as an unsaturated compound.

Thus far, butenediol has found first applications as a chemical intermediate for polymers, (including polyurethanes and epoxies) herbicides and insecticide. Various butenediol compounds will offer possibilities in the area of soil fumigants, acrylic polymers, flame-resistant resins, poultry-growth agents, and snythetic rubber.

Antara Chemicals, a Division of General Aniline & Film Corp., Dept. PVP, 435 Hudson St., New York 14, N. Y.

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Paul O. Abbé design and workmanship make for this simplicity and economy. Lathe-turned cylinders are equipped with extra large alloy steel trunnions. Important design elements include fine pitched machine cut gears, bottom pinion mounting for flexibility of rotation and equal distribution of running strains, motor base an integral part of main stand to maintain perfect alignment, heavy reinforced ends to prevent deflection, and other exclusive features.

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"We have six Paul O. Abbé Mills—three Pebble Mills, three Ball Mills. We have been using them for twenty years. We like them for their simplicity. Manpower requirements are low. We have a minimum of maintenance. We have found them mechanically nearly perfect."

Why be satisfied with inferior performance, breakdowns, and excessive maintenance costs, when you can have a Paul O. Abbé Mill, generally recognized as the outstanding Mill throughout the paint industry.

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NEW MATERIALS — EQUIPMENT

NONIONIC SURFACTANTS
Water Soluble

Five new nonionic surfactants have been introduced for use in the chemical and paint, industries.

Three of the new surfactants—Tergitol nonionics 12-P-6, 12-P-9, and 12-P-12—are based on dodecyl phenol. Two are based on trimethyl nonanol—Tergitol nonionics TMN-3 and TMN-10.

Tergitol 12-P-6 is a dodecyl phenol adduct with 6 mols of ethylene oxide. It is soluble in aromatic and aliphatic hydrocarbons and suitable for sulfation. Tergitol 12-P-9 is a dodecyl phenol adduct with 9 mols of ethylene oxide. It is soluble in aromatic hydrocarbons and can be used in place of nonyl phenol adducts containing 5 to 8 mols of ethylene oxide. Tergitol nonionic 12-P-12 is a dodecyl phenol adduct with 12 mols of ethylene oxide. It is a general purpose nonionic, completely water soluble.

Tergitol TMN-3, a trimethyl nonanol adduct with 3 mols of ethylene oxide, is soluble in aromatic hydrocarbons and slightly soluble in aliphatic hydrocarbons and mineral oil. Tergitol TMN-10 is a trimethyl nonanol adduct with 10 mols of ethylene oxide. This general purpose surfactant is also completely water soluble.

Tergitol nonionics 12-P-6, 12-P-9, and 12-P-12 are available in tank car quantities (the latter two upon notice) and drum quantities. Prices are 22½ cents a pound for tank-car lots, 25 cents a pound for truck-loads of drums, and 27 cents a pound for less than truck-load lots of drums.

Tergitol nonionics TMN-3 and TMN-10 are available in drum quantities. Prices are 27½ cents for truck-loads of drums and 28½ cents a pound for less than truck-load lots of drums.

Union Carbide Chemicals Co., Dept. PVP, 270 Park Ave., New York 17, N. Y.

PEARL PIGMENTS
Twin Inherent Colors

The synthetic pearl essence in colors which was introduced earlier this year are now available in colors of greater intensity and higher lustre.

While they react like conventional pearl pigments in all respects, the colors also have twin inherent colors: one observed by reflected light, and the second seen by transmitted light. This two-color play in each pigment makes possible effects which cannot be achieved with conventional dyes or pigments. The colors provide an effect verging in the iridescent and the new intense pigments permit an increased degree of color play.

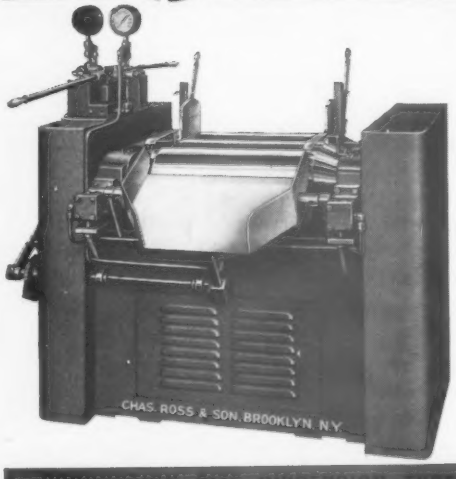
Unlike conventional dyes and pigments, they are produced by optical effect rather than by the absorption of a particular band of wave lengths. Blue, Green, Red, Orange, and Gold are a few of the colors now available in formulations for surface coating and incorporation into plastics.

The Mearl Corp., Dept. PVP, 41 East 42nd St., New York 17, N. Y.

HYDROXAMIC ACIDS
Reactive OH and NH Group

Two fatty hydroxamic acids, oleyl-and fatty C-16 C-18-hydroxamic acids, are now available commercially. They are interesting chemical intermediates because they have a reactive OH and NH group, as well as a long chain fatty group. They can react with alkalis, metallic ions and acylating agents. Some of the metallic salts are highly colored. On heating

NEW Ross HIGH SPEED THREE ROLL MILLS WITH — ONE POINT HYDRAULIC ROLL ADJUSTMENT

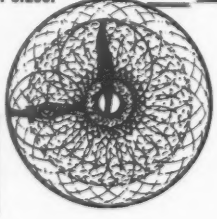


1. Pressure indicating gauges provide greater ease in properly setting rolls, and less skill or experience is required by operator.
2. Roll pressure settings can be recorded for exact reproduction of material assuring standardization of product.
3. Special equalizers assure positive parallelism of roll faces at all times for uniform dispersions and minimum maintenance costs.
4. Mills have quick roll release with safety overload feature, and are convertible for either fixed or floating center roll operation. 2½x5, 4½x10, 6x14, 9x24, 12x30, 14x32, and 16x40" sizes.

PRODUCTION SIZE DISPERSION TYPE CHANGE CAN MIXERS WITH — DOUBLE PLANETARY STIRRER ACTION

- Stirrers with special blade angles and very close clearances revolve on their own axis and also around can developing 12 intense compressive and shearing actions with each revolution to break down and disperse agglomerates.
- Variable speed for infinite range of stirrer speed control.
- Simplified vertical hydraulic lift for greatest ease in cleaning down stirrers.
- Non-revolving can is completely enclosed during mixing for safety and to reduce solvent loss. Cans can be jacketed or fitted with slide gate when required. Cans are easily positioned or removed from Mixer.
- Extra heavy construction and standard type motor eliminate costly downtime. Oversized motor drives can be provided for kneading and mixing extremely heavy materials. 1, 2, 3, 4, 6, 8, 12, 25, 50, 65, 85, 125 and 150 gallon sizes.

Area of can contacted by stirrers during only one revolution of stirrers around can (2 seconds). Position of stirrers advances 4½° with each successive revolution to sweep entire area and all points on sides of can. Stirrers overlap each other as well as center of can.



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they form isocyanates which can be reacted further with alcohols and amines to form urethanes and ureas respectively. The isocyanates form carbamic acids with water.

Industrially, fatty hydroxamic acids may be used for surface-active compounds, pigment dispersants, dyeing aids, detergents, disinfectants, tanning aids, and antioxidants corrosion inhibitors.

Woburn Chemical Corp., Dept. PVP, Harrison, N. J.

HIGH SPEED DISPENSER
Stainless Steel Shaft

New stationary tank type dispersers have been introduced, in various sizes from 5 gallon to 3000 gallon size.

The units feature high speed dispersion type impeller of either sawtooth disc type or with closed design multiple action millhead for producing ultimate grinds or dispersions. Impeller and shaft are of stainless steel and operate at speeds up to 5000 RPM. Tremendous impact and shear are developed which is reported to result in mixing and dispersing most paste type products in considerably less time than in other type stationary tank mixers.

Charles Ross & Son Co., Dept. PVP, 148-156 Classon Ave., Brooklyn 5, N. Y.

FILTER AID
Fast Flow Rate

Diatomite filter aid having a flow rate nearly double that of the fastest available filter aid materials has been developed. Called "Celite 560," it makes possible the filtration of extremely viscous materials that could not previously be filtered with filter aids because of too low a permeability.

Extremely useful in the manufacture of plastics, resins and synthetic fibers and films, Celite 560 provides faster flow rates in the filtration of viscous liquids than the firm's Celite 545, up to this time the company says, the fastest flow rate diatomite filter aid available.

Johns-Manville, Dept. PVP, 22 East 40th St., New York 16, N. Y.

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PATENTS

Complete copies of any patents or trade-mark registration reported below may be obtained by sending 50c for each copy desired (to foreign countries $1.00 per copy) to the publisher.

Fire-Retardant Cellulosic Compositions

U. S. Patent 2,953,463. Elmer H. Rossin, Springfield, and Milton J. Scott, Lexington, Mass., assignors to Monsanto Chemical Co., St. Louis, Mo., a Corp. of Dela.

An aqueous, alkaline cellulosic solution which forms regenerated cellulose on acidification in which is incorporated an amount of a neutral to alkaline water-insoluble reaction product of phosphoryl chloride and ammonia sufficient to provide afterglow-resistant and fire-retardant properties to a dry regenerated cellulose coagulate prepared from said solution, said reaction product having been prepared in an inert, anhydrous liquid and having a nitrogen to phosphorus atomic ratio of about 1.5:1 to 2.0:1.

Protective Coating Compositions

U. S. Patent 2,952,556. Lyle E. Gast, John C. Cowan, and Howard M Teeter, Peoria, Ill., assignors to the United States of America as represented by the Secretary of Agriculture.

A process comprising heating an alcohol selected from the group consisting of oleyl alcohol, linoleyl alcohol, linolenyl alcohol, and mixtures thereof, in the presence of an alkaline catalyst and a boron compound to form a condensed alcohol having an average molecular weight of 600 to 800, an iodine value of 80 to 95, and a hydroxyl content of 2.5 to 3.5 percent, reacting the condensed alcohol with an organic acid selected from the group consisting of acrylic acid, sorbic acid, maleic acid, and soybean oil fatty acids to form an ester, and dissolving said ester in a solvent containing a cobalt napthenate drier to form a coating composition.

Production of Unsaturated Polyester Resins

U. S. Patent 2,959,559. Hermann Delius, Hamburg-Lokstedt, Germany, assignor to Reichhold Chemicals, Inc., Detroit, Mich.

A process for producing an unsaturated mixed polyester resinous composition which will cure in the presence of air with a tack-free surface, which process comprises (*a*) 1,2-epoxidizing at least one unsaturated oil until it has reached an oxirane content between 1 and 4 percent and an iodine number between 150 and 100, (*b*) esterifying an amount of 20 to 90 mol percent of at least one alpha beta unsaturated dicarboxylic acid and an amount of 80 to 10 mol percent of a saturated dicarboxylic acid with such an amount of an aliphatic saturated dichydric alcohol at temperatures between 170° and 220° centigrade that the resulting polyesters have acid numbers between 40 and 120, (*c*) reacting the intermediate products obtained by the steps (*a*) and (*b*), in such molar ratios that a product having an acid number not higher than 30 is attained, and blending said product with a polymerizable vinyl monomer.

Paint Stripping Method

U. S. Patent 2,962,395. Lewis J. Brown, North Wales, Pa, assignor to Pennsalt Chemicals Corp., a Corp. of Pa.

A paint stripping composition for use in aqueous solution consisting predominantly of 50-96% by weight of a caustic alkali, and minor amounts of a gluconate and an alkyl aryl sulfonate having the formula R—Ar—SO_3X wherein R is at least one alkyl group having a total number of carbon atoms of from 1-5, Ar is an aryl group of the group consisting of benzene and naphthalene groups and SO_3X is one of the group consisting of sulfonic acid and its salts.

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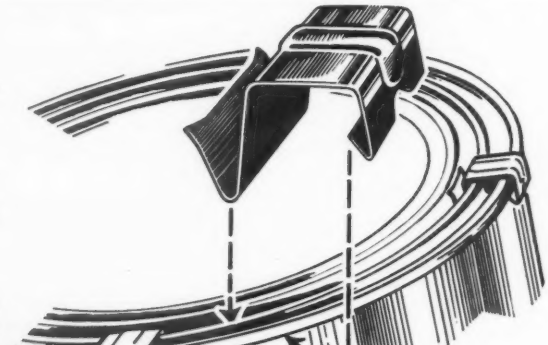

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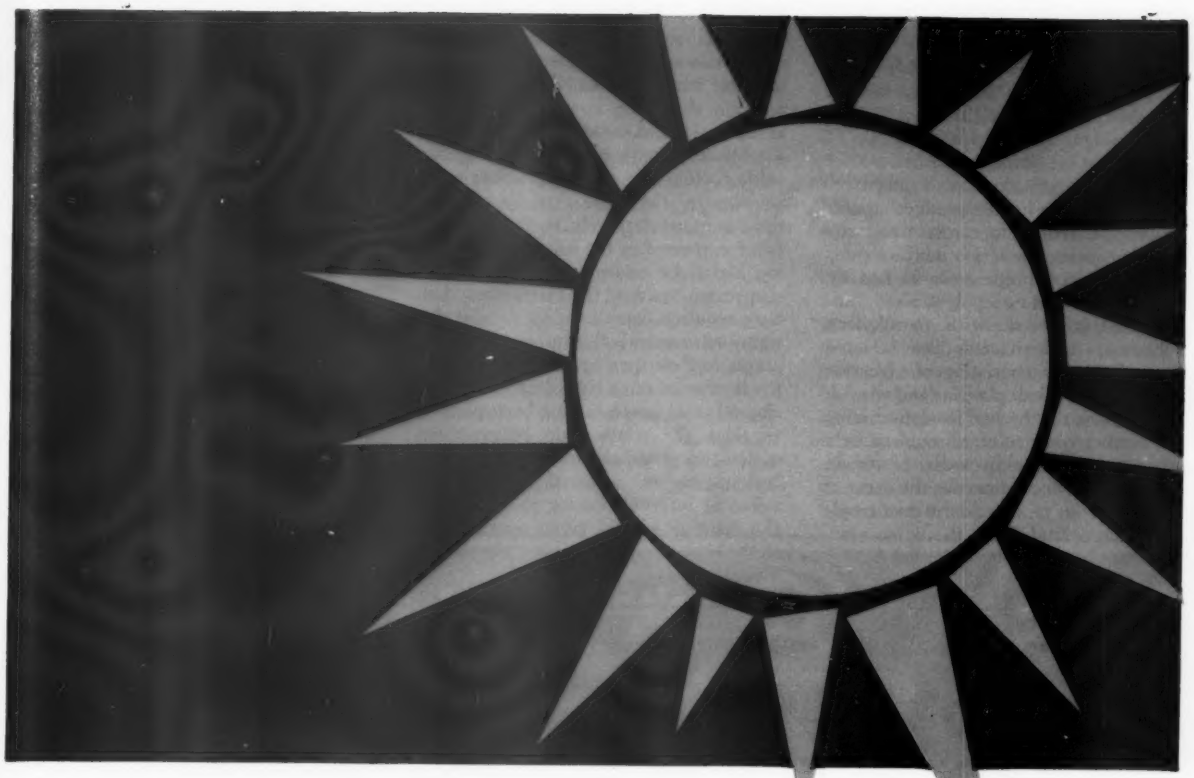

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2-NP ($CH_3CHNO_2CH_3$) is an extraordinarily versatile member of the CSC Nitroparaffin family. Its most important property is its strong solvent power for a wide variety of materials including many natural resins, synthetic resins, coating materials, dyes, organic chemicals and fats and oils. Of special interest is the cosolvent effect of 2-NP and/or toluol and alcohol, making it an outstanding solvent for many vinyl resins and acrylics. It is a superior solvent for epoxies and cellulosics.

2-NP is to the newer coatings what butyl acetate has been to nitrocellulose – an ideal solvent. 2-NP's evaporation rate permits maximum flow and leveling without delaying drying time.

Unlike ketones, 2-NP in vinyls eliminates problems of solvent residue and solvent odor, too. It has several safety features such as relatively high flash point and a high lower-flammability limit of vapors in air. Write for all the literature that details how CSC's 2-Nitropropane can brighten your day.

Evaporation Rate of 2-NP Compared to Other Solvents (volume)

Acetone	975
MEK	568
Toluol	197
MIBK	186
2-NP	110
n-Butyl Acetate	100
Xylol	69
Cellosolve	38
Isophorone	4.3

Flash Points (°F Tag Open Cup) of 2-NP Compared to Other Solvents

Acetone	16
MEK	30
Toluol	56
MIBK	81
Xylol	85
n-Butyl Acetate	92
2-NP	103
Cellosolve	126
Isophorone	202

Comparison of Lower Limit of Flammability of 2-NP With Other Solvents (% by volume in air)

MIBK	0.9
Xylol	1.0
Toluol	1.27
n-Butyl Acetate	1.7
MEK	1.8
Acetone	2.15
2-Nitropropane	2.6
Cellosolve	2.6

NITROPARAFFINS DEPARTMENT

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Determining End Point of Polyamide Modified Vehicle Cooks

U. S. Patent 2,962,461. Norbert F. Toussaint, Skokie, and Taki J. Anagnostou, Chicago, Ill., assignors to T. F. Washburn Co., Chicago Ill., a Corp. of Dela.

In the process for the production of a thixotropic vehicle for protective coatings by heating a reaction mixture comprised of a polyamide resin formed by the reaction of a polymerized unsaturated fatty acid with an alkylene polyamine, and an ester base selected from the group consisting of glyceride oils, oil-modified alkyl resins and varnish ester bodies, the method for determining the further reaction time required at a given temperature in order to obtain a product having properties the same as the properties of a standard thixotropic vehicle prepared from the same reactants, which comprises dissolving with heat a sample of the reaction mixture before the reaction end-point has been reached in a solvent in which both the hot and when cold and which forms a solution therewith in which the unreacted polyamide resin is appreciably soluble hot but substantially insoluble cold, cooling the resulting solution to precipitate the unreacted polyamide resin contained therein to form a suspension thereof in the solution, measuring the light transmissibility of said suspension, reading the further reaction time required corresponding to said determined transmissibility value from a graph, and continuing the reaction until the further reaction time determined has elapsed, said graph having been plotted to show the relationship between reaction time and light transmissibility of test suspensions prepared from samples taken at intervals during the course of the reaction at said given temperature used to prepare said standard thixotropic vehicle whose properties are to be duplicated, said test suspensions having been prepared using the same solvent and in the same proportions as those used to prepare said first-described test suspension.

Metal Coating Compositions

U. S. Patent 24,875. Louis McDonald, Altadena, Calif., assignor to Kelite Corp., Los Angeles, Calif., a Corp. of Calif.

A corrosion protective composition for metals comprising an aqueous coating bath including a major proportion of a water-soluble inorganic component reactive with said metal to provide a corrosion-resistant coating thereon and a minor proportion of from about 10-20% by weight based on said water-soluble inorganic component of a polymeric material containing a strong polar grouping selected from the group consisting of polystyrene sulfonic acid, polystyrene phosphonic acid, styrene heteropolymer of maleic acid, styrene heteropolymer of ammonium maleate and polystyrene sulfonic acid ammonium salt.

Thermosettable Interpolymers Containing Hydroxyl Groups

U. S. Patent 2,962,462. Earl C. Chapin, Springfield, Mass., and Raymond H. Reinhard, Galveston, and William F. Yates, Texas City, Tex., assignors to Monsanto Chemical Co., St. Louis, Mo., a Corp. of Dela.

A surface coating composition comprising an organic solvent solution of an interpolymer esterfied with from 30-120 parts by weight, per 100 parts of interpolymer, of unsaturated fatty acids containing from 10-18 carbon atoms; said interpolymer comprising (*a*) from 10-40% by weight of an ethylenically unsaturated alcohol selected from the group consisting of allyl alcohol, methallyl alcohol and mixtures thereof, (*b*) from 60-90% by weight of a styrene compound selected from the group consisting of styrene, ring-substituted alkylstyrenes, ring-substituted chlorostyrenes, ring-substituted alkylchlorostyrenes and mixtures thereof and (*c*) from 0.1-10% by weight of a polyethylenically unsaturated monomer selected from the group consisting of divinyl benzene, triallyl cyanurate, diallyl ether, dicyclopentadiene, ethylene glycol diacrylate and ethylene glycol dimethacrylate.

Coating Compositions

U. S. Patent 2,962,460. Earl C. Chapin, Springfield, Mass., and Richard F. Smith, Albany, N. Y., assignors to Monsanto Chemical St. Louis, Mo., a Corp. of Dela.

A protective coating composition comprising an organic solvent solution of a resin mixture consisting essentially of 10-90% by weight of a terpolymer resin and, correspondingly, 90-10% by weight

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of a coating resin of the group consisting of an alkyd resin, an epoxy resin, a phenol-formaldehyde resin, a urea-formaldehyde resin, a melamine-formaldehyde resin, and mixtures thereof; said terpolymer resin being selected from the group consisting of (*a*) a terpolymer of monomers consisting of (1) 1-40% by weight of an allyl alcohol compound of the group consisting of allyl alcohol, methallyl alcohol and mixtures thereof, (2) 30-95% by weight of a vinyl ester of a 1-20 carbon atom monocarboxylic acid that is free of olefinic and acetylenic unsaturation, and (3) 1-50% by weight of an alpha, beta-ethylenically unsaturated monocarboxylic acid and (*b*) an ester formed from a terpolymer of (*a*) and 10-80% by weight of a stoichiometrically equivalent quantity of a monobasic fatty acid containing 12-20 carbon atoms in its structure.

Paints Based on Portland Cement

U. S. Patent 2,953,467. Kenneth Wilson Jones, Gravesend, Kent, and Peter Joseph Jackson, Swanscombe, Kent, England, assignors to The Associated Portland Cement Manufacturers Limited, London, England, a Corp. of Great Britain.

A dry and free-running composition, consisting essentially of Portland cement and a stearate water-repellent compound for use as a paint when mixed with water and additionally containing 0.05-2.00% of a member selected from the group consisting of straight and branched chain aliphatic monohydric alcohols having 6-10 carbon atoms per molecule, including a mixture of such alcohols.

Automatic Spraying of Coatings on Objects

U. S. Patent 2,961,990. Quayne L. Wruck, Greenfield, Wis., assignor to Allen-Bradley Co., Milwaukee, Wisc., a Corp. of Wisc.

In a spray control operatively associated with means for moving objects to be coated past a spray station and normally inoperative spraying means positioned to deliver coating material within a predetermined coating area so as to coat objects moving therethrough, the combination including; a light source positioned on one side of said objects to cast a beam of light upon the objects as they approach said coating area, light sensitive means disposed on the same side of said objects and arranged to intercept light reflected from a portion of said light beam by said moving objects, said portion of said light beam from which reflected light will be intercepted by said light sensitive means being spaced apart from said coating area in a direction opposite to the direction of travel of the moving objects, means responsive to the presence of reflected light upon the light sensitive means for causing the emission of coating material from said spraying means.

Modified Urea Resins

U. S. Patent 2,959,558. Harry M. Culbertson, Wilbraham, and Frank J. Hahn, Springfield, Mass., assignors to Monsanto Chemical Co., St. Louis, Mo., a Corp. of Dela.

A resin comprising an etherified reaction product of at least 2 mols of a monohydric alcyclic alcohol containing 1-6 carbon atoms and a co-condensation product of 1 mol of urea, 0-0.3 mol of melamine, 0.02-0.5 mol of an N-substituted melamine of the group consisting of N,N′ - dicyclohexylmelamine, N,N′,N″ - tricyclohexylmelamine and mixtures thereof, and at least 2 mols of formaldehyde.

Drier Compositions

U. S. Patent 2,961,331. Gordon Kirke Wheeler, Trumbull, Conn., assignor to R. T. Vanderbilt, Inc., New York, N. Y., a Corp. of N. Y.

A drier composition for decreasing the drying time of coating compositions consisting essentially of a metallic drier and an α-substituted pyridine compound as an accelerator therefor selected from the group consisting of 2 - (2 - pyridyl) - benzimidazole, 1 - (2 - pyridylazo) - 2 - naphthol, 2 - picolyla - mine, 2,2′ - dipyridylamine, 2 - pyridine-methaldoxime, 2 - pyridinealdoxime, 2 - (2 - pyridyl) - benzoxazole, 2 - pyridinaldazine, and bis - (2 - pyridinal) - ethylenediamine; the weight ratio of the accelerator to the metal content in the metallic drier lying in the range from about 0.1:1 to about 61:1.

A STRONG LINK in the chain of paint, varnish or lacquer ingredients is the right solvent. That's why so many paint formulators specify APCO solvents—known to the industry more than 35 years for their *uniformity* and dependability in such vital properties as:

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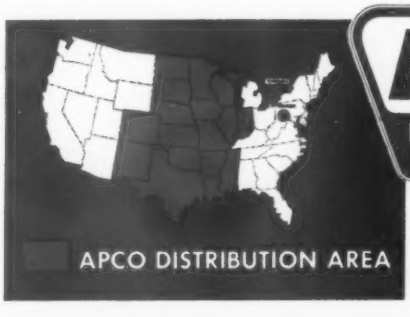

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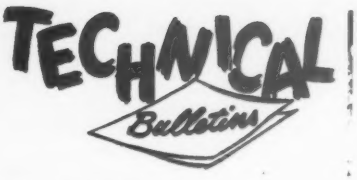

PEARL PIGMENTS

Technical brochure covers properties, typical uses and general procedure concerning the applications for pearl pigments.

This brochure is in color and the cover is on paper attractively coated with the pigments and visually depicts some of the applications for them.

The brochure contains general discussion, concerning the properties of pearl pigments, problems of orientation and techniques, types available and other pertinent data.

A separate chart lists each product, its properties and use which enables a prospective user to select a product most suitable for his specific use based on chemical and physical stability, compatibility, lustre and brilliance.

Separate sections are provided covering technical information under the following headings.
B1) Coating B2) Casting B3) Compounding B4) Cosmetics.

Rona Pearl Corp., a Division of Rona Laboratories, Inc. East 21st St., East 22nd St., Bayonne, N. J.

VISCOSITY CHARTS

The charts represent a graphical study of viscosity data obtained from various samples of ½ second RS nitrocellulose at their respective concentration in commercially obtained solvents.

The nitrocellulose used was blended to 3.25 seconds in accordance with the standard procedures of ASTM D301-56 #11 and approximations inherent in the use of a viscosity blending chart.

Grab samples of nitrocellulose were extracted from production drums as received. The assumption was made that the alcohol content was 30%. No effort was made to adjust the alcohol content.

A sample was made of a portion of this material and non volatile was determined using the procedure of ASTM D33348A. Upon the basis of this non volatile determination, additional alcohol wet nitrocellulose or solvent was added to adjust to the desired 40% non volatile.

The sample was then aged for 48 hours and a viscosity was run using Brookfield Viscometer Model #RVF at 25°C. Sufficient solvent was then added to the sample to reduce it to 35% non volatile with agitation and then aged 48 hours, and viscosity run in the same manner.

This procedure was repeated to obtain the data shown on the charts. In all cases, five separate samples were run and the result indicated was the arithmetic means of the results obtained.

Cellofilm Industries, Inc., Dept. PVP, Wood Ridge, N. J.

FATTY ACIDS

New booklet, "Coconut Fatty Acids," covering caprylic, capric, lauric and myristic acids, stripped and distilled coco acids and a capric-myristic blend has been prepared.

The booklet provides specifications of the above Neo-Fats and their compositions as determined by gas chromatography.

Coco fatty acids find applications in such diverse products as paints, flavors, essences, pharmaceuticals, disinfectants, anti-foaming agents, insecticides, detergents, dyes, lubricating oils, soaps, plastics and textiles.

Armour Industrial Chemical Co., Dept. PVP, Chicago 6, Ill.

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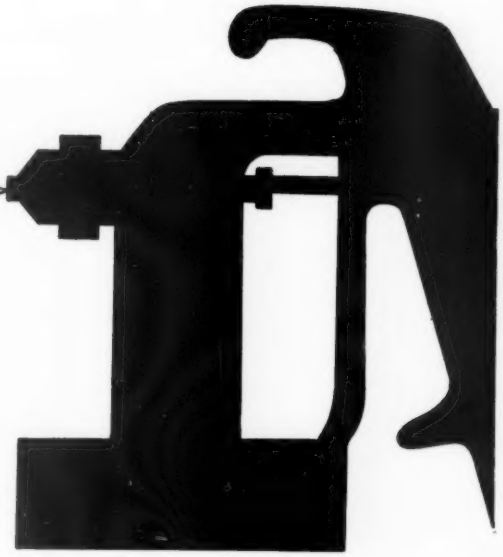

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. . . perfect balance for excellent blackness.

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. . . the all-purpose black . . . fine jetness at moderate price.

STATEX®
. . . for economical blue grey tints and dark machinery greys.

MOLACCO®
. . . ideal for minimum flooding and floating.

PAINT FINISHING

New 12-page bulletin describes complete paint finishing systems and component units.

The bulletin, PF-400, includes a pictorial story of the finishing line, pictures, descriptions and technical data of the individual component parts, construction and conveyors.

There is also a section on the strip coating line, metal decorating units, and laboratory facilities.

J. O. Ross Engineering, Div. of Midland-Ross Corp., 730 Third Ave., New York 17, N. Y.

ETHERS

New 40-page booklet, describing the properties and uses of ethers and glycol diethers has just been published.

The booklet contains comprehensive data on ethyl ether, isopropyl ether, butyl ether, and 1,4-dioxane and the glycol diethers; diethyl Carbitol, dibutyl Carbitol, and methyl ethyl Carbitol.

Included is information on physical properties; solubilities; constant-boiling mixtures; specification limits; test methods; storage, handling, and shipping; physiological properties; and selected literature references.

Ethers are solvents for alkaloids, dyes, fats, gums, oils, perfume oils, resins, and waxes. They are also components of plating baths, duplicating fluids, shoe cleaners, rubber cements, paint and varnish removers, nitrocellulose lacquers, "cold" hair-waving preparations, wood dyes and stains, and fuels for aircraft and model engines. They are utilized, as such, to dewax petroleum oils, as dry-cleaning "spotting" agents, and in certain metals separation baths. As extractants, ethers are essential to the production of vitamins, hormones, thioglycolic acid, nicotine, plastics, explosives, and cellulose acetate fibers.

Union Carbide Chemicals Co., Dept. PVP, 270 Park Ave., New York 17, N. Y.

PUMPS

New booklet describes a unique motorpump that combines a vane-type priming pump with a conventional high-efficiency centrifugal pump to get the advantages of both.

Used to handle a variety of liquids, the new "centri-prime" motorpump is specifically designed for work involving suction lifts or vapor handling problems. It is particularly useful for handling petroleum products in bulk stations. The booklet presents sketches of pipe-pump-tank layouts showing top unloading of a tank car; top unloading a transport; pumping from underground storage; and combination loading, unloading, and transfer.

Text and drawings in the booklet show how the priming pump unit evacuates air and/or vapor from casing and pipe, creating a partial vacuum and a flow of liquid which floods the casing, after which the conventional centrifugal pump takes over. The illustration also shows a check valve which can be supplied with the pump when there is no check valve in the piping system. The valve vents into the pump discharge. A valve can be substituted to vent into the atmosphere, or a vent tube can be run back to the source tank.

A table in the booklet gives the dimensions of the new pumps, which are 14-7/8" high and range from 28-1/8" to 34-½" long. Illustrations show the four positions in which the pump casing can be fixed to obtain the best direction of discharge, eliminating pipe el-

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Extra Profit RUSH JOB possible!
1:00 P.M. Rush order received by phone. Kady Mill is running on another order. Ball and Pebble Mills are charged and unavailable until next morning.
1:20 P.M. Kady Mill charge is finished and dropped.
1:30 P.M. Kady Mill is clean and ready for new charge.
1:45 P.M. Production Order issued and Kady Mill is charged.
2:15 P.M. Kady Mill batch okayed by lab. and ready for letdown.
3:00 P.M. Order is on the truck headed for another satisfied customer.
What other equipment except a Kady Mill could have handled this rush order?
Dispersion jobs that normally take 24 hours in other mills can be accomplished in 15 minutes with a Kady due to its exclusive kinetic dispersion principle. Low in initial cost, easy to install in little floor space, the Kady Mill can give you better quality, lower costs and higher profits.
Write for literature.
Kady Mills are available in capacities from ½ gallon up to this 600-B 800 gallon model illustrated above.
Kinetic Dispersion corp.
95 Botsford Place Buffalo, N. Y.

bows which increase friction and decrease delivery head.

Ingersoll-Rand Co., Dept. PVP, 11 Broadway, New York 4, N. Y.

SURFACE ACTIVE AGENTS

A broad spectrum of cationic and non-ionic surface active agents, ranging from fatty nitrogen derivatives to polyether alcohols are described in a new four-page booklet. Among other chemicals discussed are fatty imidazoline diamines, fatty amidomonoamines, fatty amidodiamines, quaternary ammonium chlorides, oxyalkylation products, and colloidal silicas. Physical characteristics of the chemicals and some of their uses are included.

Nalco Chemical Co., Dept. PVP, 6216 West 66th Pl., Chicago 38, Ill.

PROCESS EQUIPMENT

New 16-page catalog on process equipment has been published. Included are technical data on processing systems and vessels, conical blenders and vacuum dryers, grinding mills, the Mil-Reactor and a variety of agitation and mixing equipment. A section also is devoted to ceramics—for grinding media and linings, for catalyst suspension, and for corrosion and abrasion-resistant applications.

The Patterson Foundry and Machine Co., Dept. PVP, East Liverpool, Ohio.

LABORATORY EQUIPMENT

New edition of "What's New for the Laboratory"—41st in the series, is announced.

Thirty-five new items are illustrated and described in the new issue. These include Burd-Watcher II—a new device for automating, programming, monitoring and controlling reactions and distillations of *any* size. . . . new compan*ion* pH meter which features three simple controls. . . . ultramicro analytical program for the analysis of blood and other biological fluids . . . . international model CS general-purpose centrifuge with speeds up to 23,400 rpm and gravities of 37,950. . . . a space-saving incubator that not only accommodates test tubes, but flasks, slides, petri dishes, beakers and other types of glassware. . . . a plastic test tube rack that allows full view of the test tube contents. . . . two new laboratory supports — little jack and big jack. . . . new line of hot plates. . . . hydrogen flame detector for the GC-2 gas chromatograph . . . . new line of two-dial balances, plus various new glassware items and other types of laboratory equipment and supplies.

Scientific Glass Apparatus Co., Inc., Dept. PVP, Bloomfield, N. J.

ACETYLENE CHEMICALS

Ready-reference data sheet on all of the company's commercially available high-pressure acetylene derivatives is available.

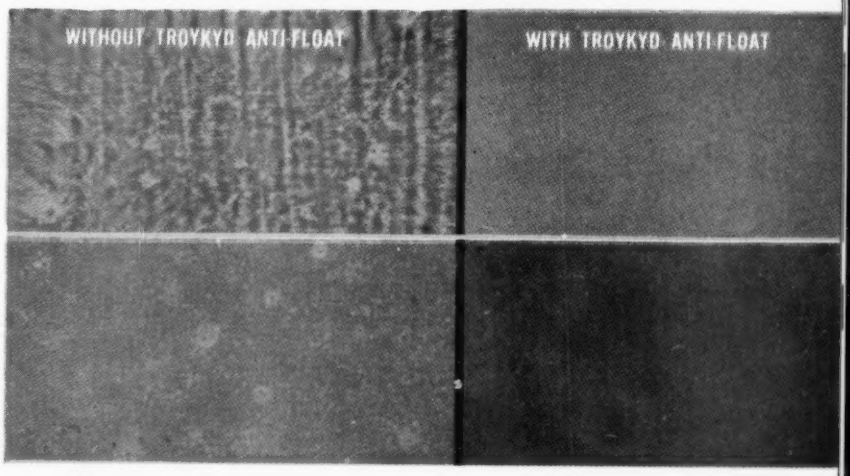
Each of the products described which includes PVP, PVP/VA Copolymers, PVP-Iodine, Vinylpyrrolidone, Methylpyrrolidone, 2-Pyrrolidone, Butyrolactone, 1,4 Butanediol, Butenediol, Butynediol, and Propargyl Alcohol and Halides, are described in considerable detail. Chemical structures, physical forms and descriptions are given, as well as a listing of properties and uses.

The publication is produced on a three-page fold-out, suitable for bulletin board as well as file use, in red and black on white back ground.

Acetylene Chemicals Department, Antara Chemicals, a Division of General Aniline & Film Corp., Dept. PVP, 435 Hudson St., New York 14, N. Y.

TROYKYD

ANTI-FLOAT



Stops FLOATING and SILKING 2 WAYS

1. It disperses the pigments into a near-colloidal state and deflocculates them by improving the wettability of the vehicle.

2. It controls the surface activity of the paint film by adjusting surface tension, thereby minimizing the tendency of finer pigments to float to the surface.

LOW IN COST: As little as 2 pounds of TROYKYD per 100 gallons of paint will control floating and silking in most cases. Introduced at the pigment grinding operation, this additive helps you formulate commercial paints at a practical cost where color pigments have a tendency to float.
Write or call us for further information.

BE SURE you receive our October, 1960, TROY Technical Quarterly, Vol. 1, No. 1. Drop us a note on your letterhead and we will include you on the list.

TROY CHEMICAL COMPANY

Self-spray paint troubles stop here

This is part of Sprayon's quality-control laboratory, where six full-time chemists and paint technicians make sure that your aerosol finishes—custom-loaded by Sprayon—never vary in color or performance. Before production begins, even on a routine re-order, prototype cans are made up in the laboratory and given an accelerated aging test equal to a year of shelf life. Test panels are then sprayed and the film is analyzed by precision instruments. Gloss and other characteristics are checked. Color is double-checked under a MacBeth light, the accepted standard of the paint industry. The spray pattern and the mechanical efficiency of the container are checked. All test data, materials and samples are dated, coded and filed for a year for later reference. Sprayon quality control is one reason why Sprayon has handled the greatest possible variety of contract-loading assignments for many of the nation's largest manufacturers—year after year after year. Get the full Sprayon story today.

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AEROSOL COATINGS

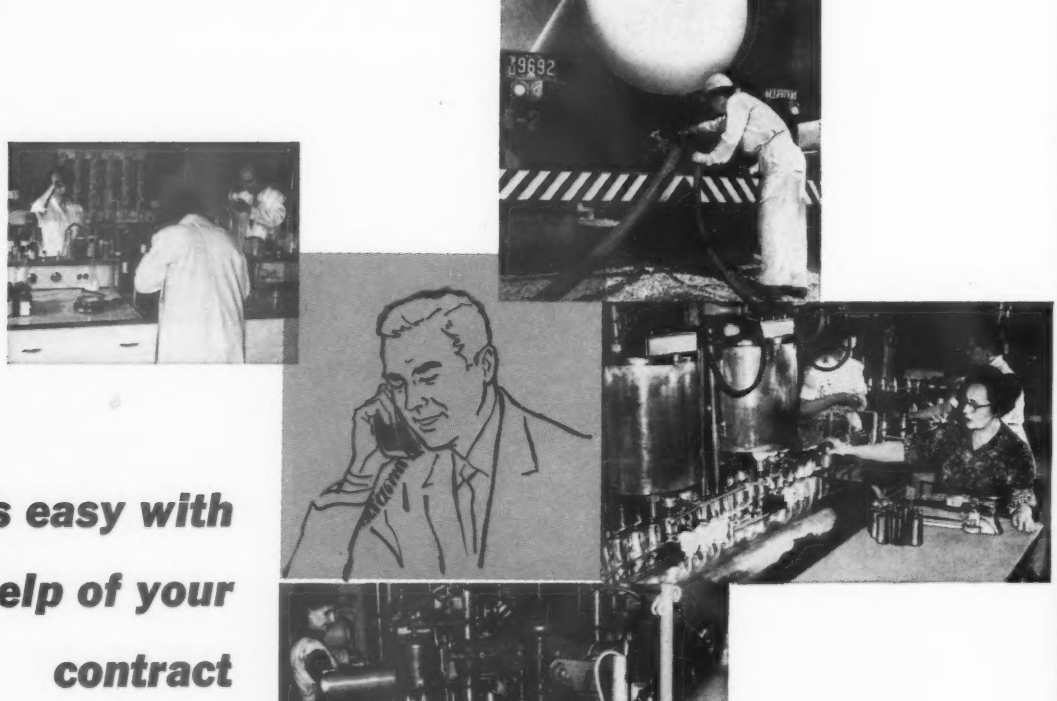
PACKAGING

FORMULATION

PRODUCTION

Ralph Epstein, left, a partner in Dox Automotive Supply at Detroit, inspects a can of new Plasti-Kote Car Color with Vincent Candela. The product has upped Dox automotive sales and required the company to move to a new 60,000 square foot location. Dox annual sales of Plasti-Kote products has jumped from $5,000 to more than $100,000 in the three years the company has handled the Car Color line.

Take a giant step into aerosol packaging



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HIGHLIGHTS OF CSMA 47th MEETING

Aerosol Division program featured quality control panel covering valves, containers, propellants, and various test methods.

By
Dr. John J. Sciarra*

THE Forty-Seventh Annual Meeting of the Chemical Specialties Manufacturers Association was held during the week of December 5-8, 1960 at the Hollywood Beach Hotel, Hollywood, Florida. The attendance has been estimated at over 1000, including representatives of the aerosol, automotive, detergent and cleaning compounds, disinfectants and sanitizers, insecticide, and waxes and floor finishes industry. In addition to the several general sessions and committee meetings held during the week, each division had individual meetings at which time many interesting and timely papers were presented.

Of special interest were the papers presented at the Aerosol Division Meeting held on Wednesday morning, December 7, 1960. The first portion of the program was devoted to a panel discussion of "Quality Control in the Filler's Plant" moderated by George Barr of G. Barr and Company. A series of papers were presented by representatives of manufacturing concerns. The topics covered included the following: An Aerosol Quality Controller looks at Valves (by Norbert H. Brusky of S. C. Johnson and Son, Inc.); Quality Control of Aerosol Containers (by Russell P. McGhie, Colgate-Palmolive Company); Propellants and Propellant Systems (by Donald E. Dean, Shulton Incorporated); Concentrate and Concentrate Systems, Production Line Filling, and Water Bath Spray Checking Systems (by S. J. Campbell, Continental Filling Corporation); Laboratory Quality Control Procedures (by Daniel H. Terry, Boyle-Midway, Div. of American Home Products Corp.); Special Quality Control Required for Pharmaceuticals (by John C. Armstrong, Armstrong Laboratories); Special Quality Controls for Food Aerosols (by Clarence Clapp, Western Filling Corp., but presented by Fred Presant, Aerosol Techniques, Inc.); The Kind of Quality Control a Marketing Man Expects from his Aerosol Filler or Contract Loader (by Thomas S. Harrison, Lehn and Fink Products Corporation); and Application of Statistical Quality Control to Aerosol Filling (by Edwin K. Kitow, G. Barr and Company).

The importance of quality control precedures for aerosol valves was covered by Mr. Brusky. He divided quality control into three distinct areas:

a) quality of incoming valves
b) maintenance of quality when valves are used, and
c) quality follow up (sample file)

Incoming valves should be inspected before they are used in production. In sampling the shipment, Mr. Brusky suggests the following procedure in order to obtain a representative sample:

if shipment consists of 1-5 cartons, sample all

if shipment consists of 6-15 cartons, sample 7

if shipment consists of 16-65 cartons, sample 10

if shipment consists of 66-110 cartons, sample 15

if shipment consists of 111-180 cartons, sample 25

if shipment consists of 181-300 cartons, sample 35

For each carton sampled, examine 50 valves visually as to button (actuator) stem, valve cup, flowed-in-gasket, valve body, dip tube, etc. These should be compared with specifications. Then five valves are selected and inspected in more detail.

"When deciding whether to reject a shipment for return, you must realize that certain defects, though you may not be happy with them, will be pulled out in your filling process. The awareness of a defect and proper alertness and/or corrective measures on the part of line personnel might well take care of a problem."

Other points covered in this paper included a discussion of filling line inspection and quality follow up.

In conclusion, Mr. Brusky stated, "Sample and examine returned stocks of product particularly if complaints have been registered. By all means, take apart valves where the customer has complained of poor spray pattern, intermittant spray, no spray, leakage around the valve, valve shutoff failure, and the like. Correlation of complaint in-

*Associate Professor of Pharmaceutical Chemistry, St. John's University, College of Pharmacy, Jamaica 32, New York.

formation and retain sample inspection may be very enlightening. The more information you have about valve failures, the better you will be able to examine valves for those things that cause failures."

Before setting up a system of quality control for aerosol containers, the performance of the container should be considered. This is indicated by Mr. Russell McGhie in his paper on Aerosol Containers. He indicates the following requirements for aerosol containers:

1. It should run efficiently on the production line with a minimum of problems and adjustments.
2. It should hold the proper amount of the product safely.
3. It should have a shelf life according to the demands of the market (we seek a minimum of one year and prefer two-three years.)
4. It should withstand the rigors of the production lines, shipping and consumer usage.

These points are checked before and during the filling procedure. "Production sampling of filled containers and aging tests on these samples will give the filler a picture of the quality he has been receiving and shipping to his customer. It will also reveal any possible weak points that may be corrected in the manufacture of the container."

The appearance of the container is also considered in this paper. "The defects usually found on containers that are damaging to the appearance are as follows:

1. Eye-holing or cats eyes where the coating does not have a continuous effect.
2. Bleeding where one color runs into another.
3. Misregistration where one color is off register with another.
4. Poor or missing print or illegible copy.
5. Transfer when one decoration is transferred to another due to contact before paper drying.
6. Scratches from rubbing on the manufacturing line."

Although Mr. Dean made mention in his paper of the use of compressed gases (nitrous oxide, carbon dioxide, and nitrogen), the quality control system was devoted mainly to the fluorinated hydrocarbon propellant systems. He stated that the principles can be applied for the most part to any propellant system.

"Quality control of propellants in the fillers plant should provide a system for rigid and continuous inspection. This must begin with the purchase and receipt of raw materials through all the production phases, to the finished product. In addition, these should be a continuous program or product shelf life testing to assure stability of the propellant system with the concentrate."

In testing incoming propellant deliveries, the following should be considered:

1. Identification and/or composition of propellant.
2. Test for presence of free chloride.
3. Determination of moisture content.
4. Presence of non-condensible gases.

The determination of the pressure of the gas at 70°F generally identifies the gas and is accurate to within 2% of stated values. This result may be misleading when dealing with mixtures of propellants. In addition specific gravity and density may be utilized as an aid in identification. Since one is dealing with liquefied gases, the equipment used is rather complicated and one must develop suitable techniques for handling such compounds. "Vapor phase chromatography provides the most specific, rapid and informative method for the identification and composition of propellant systems. This procedure is commonly used with propellants. With the highly competitive nature of the available propellants supplied by E. I. du Pont de Nemours and Co., Inc. (Freon), Allied Chemical Corp., General Chemical Division (Genetron) Pensalt Chemical Co. (Isotron) and Union Carbide and Chemicals Co. (Ucon) one is assured that he is receiving a grade of liquefied gas meeting rigorous specifications provided by the respective manufacturer.

Ionic chloride can be tested for by mixing an alcoholic silver nitrate solution with propellant and observing the formation of any turbidity, if any. The presence of turbidity is related to the presence of ionic chloride.

During the filling procedure, Mr. Dean continues, the propellant fill weight and propellant composition is checked. The propellant fill weight is checked by placing on the line tared containers and then picking them up after filling. If the concentrate is not volatile, the propellant is allowed to evaporate after the container is weighed. When the propellant has been evaporated, the container is reweighed and the difference indicates weight of propellant. While this is not an extremely accurate procedure, it is useful "for on the line" control systems. The composition of the propellant is determined by vapor phase chromatography.

The moisture content of the propellants as supplied by the manufacturer is extremely low but during filling procedures, especially the cold filling method, there is a danger of moisture coming in contact with the aerosol product. Therefore, the moisture content is determined using the Karl Fisher method.

A quality control system as used by a custom filler was outlined by Mr. S. J. Campbell. "During these 14 years, the quality control functions have rapidly improved with the development of new techniques and apparatus. Every year new products appearing on the market in pressure dispensing package have created the necessity of adding new quality control procedures. A quality control program in a product is born actually in the development laboratory almost immediately after the product is conceived. Quality control might be referred to as a "testing program" to maintain the desirable characteristics of a product, and also to minimize the undesirable characteristics of a product".

Some of the tests and procedures used in their plant were given by Mr. Campbell and include the following: specific gravity, refrac-

tive index, distillation range, odor evaluation, clarity-evaluation, moisture determination, solids content, flash point, colorimetric determinations, pH, aniline point, acid number, saponification number, chloride content, viscosity, and identification of propellants by vapor phase chromatography.

While most of the above tests are made on incoming raw materials, checks should continuously be made on the filling line. The use of a water bath, heated to above 130°F to allow the contents of the container to rapidly attain a temperature of 130°F, is indicated to test for leaks in the container and around the valve crimp as well as to test for strength of containers. Finally, all products are tested by a spray test to insure proper operation of the valve.

One of the more important laboratory procedures includes the use of a recording infrared spectrophotometer. So stated Dr. Daniel H. Terry in his paper dealing with laboratory control procedures. This instrument can be used not only to identify the composition of the aerosol product but to detect any changes in composition that may occur during the filling procedures and also on standing.

Mr. Harrison indicated a new approach to quality control. He indicated that the custom filler should be informed of the marketing philosophy of the marketing concern as well as to develop quality control procedures which will test a "product to determine if it will do what it's supposed to do."

The last paper on this program dealt with the use of Statistical Quality Control. Mr. Kitow covered the basic fundamentals of Statistics and their application to aerosol production. The use of a standard bell-shaped curve was indicated.

The second portion of the program dealt with "Financial Aspects of Aerosol Industry" and leaders from the financial world addressed the Aerosol Division. Financing Growth Industries was given by Elliott Averett, Vice President, Bank of New York. Mr. James Sheridan, Vice President and Treasurer of Allied Chemical Corporation spoke on Credit Fundamentals: Dynamic, not Static. This was followed by a talk given by Mr. John A. Willis, Asst. Secy. and Asst. Treasurer of Union Carbide Corporation on Guideposts for Evaluating Profit Performance.

The first general session was held on Monday, December 5, 1960 and was presided by George W. Fiero, President C.S.M.A. In addition to the Presidents' address, Report of Nominating Committee, Election of Officers and Board of Governors for 1961, Mr. J. J. Tomlinson, Chairman, Aerosol Package Contest Awards Committee presented the Aerosol Package Contest Awards.

An address by Mr. William L. Shirer, Author and Foreign Correspondent, provided a change of pace for the membership. His address "The World Today" dealt with the many problems facing the world today and how they may affect the many industries. Following this talk, a panel presentation on the Federal Hazardous Substances Labeling act was given. Speakers covered all aspects of this act and indicated the effect and responsibilities this act conferred upon the Chemical Specialties Manufacturer.

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PERSONNEL CHANGES

GENERAL ANILINE

Antara Chemicals Division, announces the following executive changes:

Francis Charles has been appointed to the position of Director of Manufacturing and will be responsible for the manufacture of chemicals within the Division.

James M. Cloney has been appointed to the position of Director of Marketing and will be responsible for all sales activities of the Division.

Dr. Frederick J. Gajewski has been named Technical Director, charged with responsibility for the Technical Research and Technical Engineering Departments.

Wallace G. Clarke, formerly Area Supervisor, has been appointed to Special Assistant to the General Manager.

DAVID LITTER

Ronald Beers has been appointed as a Senior Chemist. Mr. Beers who has had extensive experience in the development of latex emulsions and paints will be in charge of the Latex Paint section of the laboratory.

PITTSBURGH PLATE

Valentine J. Grunewalder has been named Technical Director for the Newark paint factory of the paint and brush division.

SYNTHETIC PRODUCTS

G. M. Juredine has joined the firm as Vice-President, Sales. He was a consultant at Battelle Memorial Institute, Columbus, Ohio. Previously, he was Division Manager at Harshaw Chemical Company, Cleveland, Ohio.

EMPIRE VARNISH

R. L. Hawkins, Jr., was elected Chairman of the Board and Chief executive officer.

GLIDDEN

Robert P. T. Young has been appointed Manager of the Organic Chemical Department.

NATIONAL STARCH

Richard W. Reiter of the Resin Division has been promoted to the position of Laboratory Manager of the Resin Development Group.

ALLIED CHEMICAL

Neal M. Draper has been appointed President of the National Aniline Division.

CALENDAR

January 25-27. 34th Annual Convention of Assn. of American Soap & Glycerine Producers, Waldorf-Astoria Hotel, New York City.

February 13-15. Spring meeting of Committee D-1 on Paint, Varnish, Lacquer and Related Products of the American Society for Testing Materials. Hotel Roanoke, Roanoke, Va.

February 23. Protective Coatings Div. of the Chemical Institute of Canada, Divisional Conference, Toronto, Ontario.

February 24. Protective Coatings Div. of the Chemical Institute of Canada, Divisional Conference, Montreal, Quebec.

March 15-18. Annual Convention of the Southern Society for Paint Technology. Atlanta Biltmore Hotel, Atlanta, Ga.

May 5-6. Southwestern Paint Convention of the Dallas and Houston Societies for Paint Technology, Houston, Tex.

May 18-20. Southwestern Paint Convention of the Dallas and Houston Societies for Paint Technology, Houston, Tex.

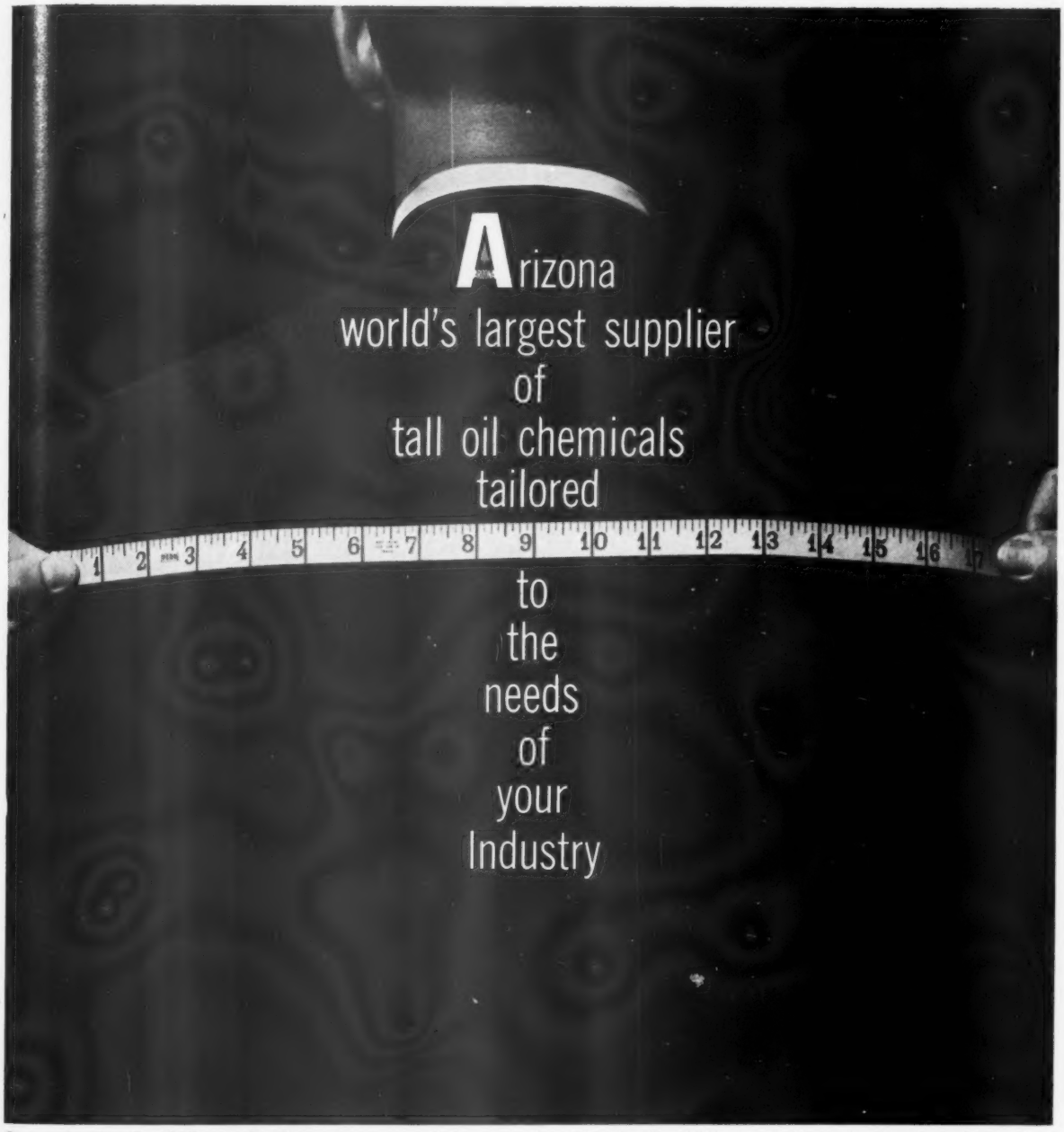
May 26-27. Fourteenth Annual Spring Symposium of The Pacific Northwest Paint & Varnish Production Club. Hotel Georgia. Vancouver, B. C.

June 2-3. Annual joint meeting of the Kansas City and St. Louis Societies for Paint Technology, Kansas City, Mo.

June 5-9. Plastics Exposition Sponsored by the Society of the Plastics Industry, New York Coliseum.

June 20-27. 6th Paint Short Course for High School Chemistry Teachers, University of Missouri School of Mines and Metalurgy, Rolla, Mo.

November 26-28. Fourteenth Annual Convention and Trade Show of the Retail Paint & Wallpaper Distributors of America at Cobo Hall, Detroit, Mich.



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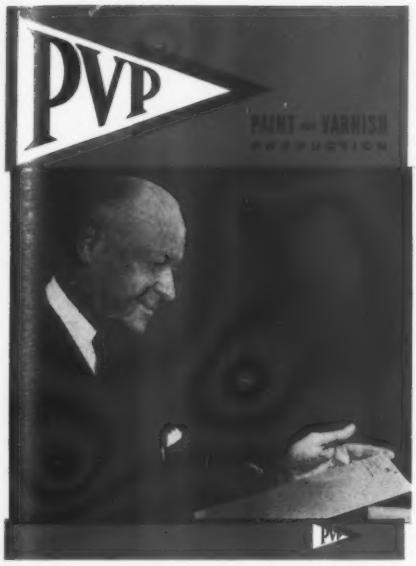

Steudel Sees Improvement In 1961 Paint Sales

LIKE a good many other industries, the paint industry experienced a slow-down in its rate of growth through 1960. Whether this slow-down will continue well into 1961 is difficult to gauge, but there are some signs that the low point is now behind us, according to Arthur W. Steudel, chairman of the Board of the Sherwin-Williams Co. Latest available figures (still incomplete) indicate that total sales for the year will about equal or be only very slightly higher than the 1.7 billion dollar record established in 1959. This is in sharp contrast to the consistent yearly gains the paint industry has enjoyed for more than a decade.

At Sherwin-Williams we fared better than the industry generally during our 1960 fiscal year which ended August 31. Our sales were 4.02% greater than in the previous year. They continued upward in the last quarter of the year but at a somewhat reduced rate.

For example, the housing industry will undoubtedly recover from the doldrums which set in during the summer of 1960. It is a good guess that total urban housing starts in the new year will increase by 4% to 5%. Furthermore, there will probably be another increase in the volume of public building since the widespread interest in the construction of schools, hospitals, etc. shows no signs of diminishing.

New construction is of great importance to the paint industry, of course. But even more important is the maintenance market. In this area there are encouraging portents. The home modernization market has been growing steadily and will surely continue to grow. It is estimated that some 30 million houses in America are in great need of modernization right now.

In addition, the lack of new commercial and industrial construction may prompt industry generally to put greater emphasis on maintenance activities to protect those buildings already standing. Paint, obviously, is the least expensive and most effective way to add to the life of existing structures.

The paints used in new construction, maintenance and modernization normally account for about 60% of the paint industry's sales. The balance is made up of sales of specialized finishing materials for industrial and transportation use. These include paints for automobiles, ships, railroad rolling stock, appliances, office and industrial equipment and a host of other products of industry.

The demand for these finishes in 1961 will, of course, depend directly on general industrial activity. There is speculation that this may decline during the first half of 1961. The decline is not expected to be a sharp one and production should rise above present levels before the end of the year.

In view of these possibilities, we at Sherwin-Williams approach the new year with cautious optimism. We expect both ourselves and the paint industry to show sales gains. However, we also expect to have to invest considerable effort in the task of keeping sales of an upward curve as competition will be more exacting.

To help spur sales, we will continue our extensive research activities. Several new products growing out of that research will be introduced during the year. Early in 1961 we will open the new Sherwin-Williams Research Center at Chicago.

In addition, we are putting considerable emphasis on improving distribution. A new warehouse near Atlanta was opened in December. Another is under construction near Boston. An expansion of warehouse facilities at Newark is also underway.

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NEWS

Sapolin Acquires Warehouse In Linden, N. J.

Sapolin Paints Inc., New York City, has acquired a modern spacious wholesale warehouse at 310 E. Elizabeth Ave., Linden, N. J., for faster and more efficient service to dealers in the area.

The warehouse will serve outlets in Union, Middlesex, Somerset, Monmouth and Ocean Counties in the state. No consumer or direct sales of any kind will be made from the new warehouse. Operations will be at the wholesale level only.

New Polymer Chemistry Group Formed in Houston

Formation of a Polymer Chemistry Group, affiliated with the Southeastern Texas Section of the American Chemical Society, has just been announced. The new group has 61 charter members representing twenty-seven Gulf Coast Companies.

Chairman G. W. Daues, Monsanto Chemical Co., stated that the objectives of the group are to foster the exchange of ideas, establish educational programs to keep pace with the rapid technological advances, and promote polymer chemistry in all aspects.

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Federation of Societies for Paint Technology
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Constituent Society Meetings

Baltimore, 2nd Friday, Marty's Park Plaza Hotel.
Chicago, 1st Monday, Furniture Mart.
C.D.I.C., 2nd Monday.
Cincinnati — Oct., Dec., Mar., May, Dick Perfidio's Wishing Well.
Dayton — Nov., Feb., April, Hotel Gibbons.
Columbus — Jan., June, Sept., Everglades.
Cleveland, 3rd Friday, Cleveland Engineering & Scientific Center.
Dallas, 1st Thursday after 2nd Tuesday, Lucas B & B.
Detroit, 4th Tuesday, Rackham Building.
Golden Gate, Monday before 3rd Wednesday, Sabella's Restaurant, San Francisco.
Houston, Monday prior to 2nd Tuesday, Rams Club.
Kansas City, 2nd Thursday, Pickwick Hotel.
Los Angeles, 2nd Wednesday, Montebello Country Club.
Louisville, 3rd Wednesday, Sheraton Hotel.
Montreal, 1st Wednesday, Qpeen's Hotel.
New England, 3rd Thursday, University Club, Boston.
New York, 1st Thursday, Brass Rail, 100 Park Ave.
Northwestern, 1st Friday, St. Paul Town and Country Club.
Pacific Northwest, 3rd Thursday, Washington Athletic Club, Seattle, Wash.
Philadelphia, 2nd Thursday, Philadelphia Rifle Club.
Piedmont, 3rd Wednesday, Rainbow Supper Club, High Point, N. C.
Pittsburgh, 1st Monday, Gateway Plaza, Bldg. 2.
Rocky Mountain, 2nd Monday, Republican Club, Denver, Colo.
St. Louis, 3rd Tuesday, Rugger's.
Southern, Annual Meetings Only.
Toronto, 3rd Monday, Oak Room, Union Station.
Western New York, 1st Monday, 40-8 Club, Buffalo.

NEWS

Vulcan Announces NewHandle At Sales Meeting

At a recent sales meeting, Vulcan-Associated Container Companies, Inc. announced a new pearl-white plastic handle designed to reduce scratching and marring of pail surfaces during shipping and handling.

According to the manufacturer, the handle's construction is said

New Pearl-White Plastic Bail Grip Demonstration Kit is shown to Executives of Vulcan-Associated Container Companies, Inc. by Gordon D. Zuck, President.

to lessen the actual contact between adjacent containers and under severe impact, acts as a "shock absorber", all but eliminating denting and deforming.

According to a market research study conducted by the firm, the design of the handles and the color adds to the attractiveness and buyer appeal of both lithographed and solid color pails, and also complements package identification.

The operating subsidiaries of Vulcan-Associated are located at: Bellwood, Ill., (Vulcan Containers Inc.); Birmingham, Ala., (Vulcan Steel Container Co.); Dallas, Tex., (Southwestern Steel Container Co.); Peabody, Mass., (Atlantic-Vulcan Steel Containers Inc.); San Leandro, Calif., (Vulcan Containers Pacific, Inc.); Rexdale (Toronto), Ontario (Vulcan Containers Ltd.); New Westminster (Vancouver), B. C. (Vulcan Containers (Canada).

New York Paint Society Installs Officers for 1961

The New York Society for Paint Technology at its November meeting installed the officers for the 1961 season. The slate of new officers were: Anthony Skett, President; J. J. Oates, Vice-President; R. L. Whitney, Secretary; Le Roy Soff, Treasurer; and John Biskup, S. Leonard Davidson and Sidney Lauren, new members of the Executive Committee.

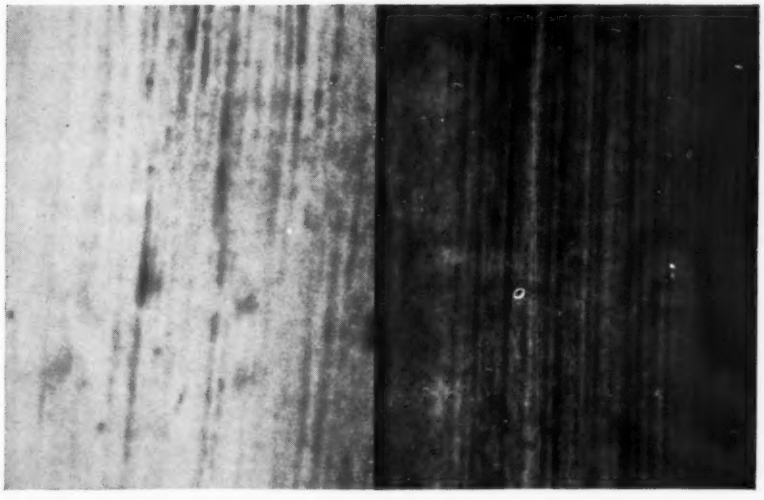
CSMA Elects Beach

Charles E. Beach, John C. Stalfort & Sons, Inc., Baltimore, Md., was elected President of the Chemical Specialties Manufacturers Association at the opening session of the association's 47th annual meeting being held at the Hollywood Beach Hotel, Hollywood Fla. Other offcers elected, were:

Charles E. Allerdice, Jr., The Bell Co., Chicago, First Vice-President; Donald J. Templeton, Stanley Home Products, Inc., Easthampton, Mass., Second Vice-President; Frederick G. Lodes, Lodes Aerosol Consultants, Inc., New York, Treasurer, and Alfred A. Mulliken, C.S.M.A., Secretary.

Elected to the Board of Governors for three-year terms were George W. Fiero, Esso Standard Div., Humble Oil & Refining Co., N. Y.; John A. Rodda, Fairfield Chemical Div., Food Machinery & Chemical Corp., N. Y., and Joseph J. Tomlinson, General Chemical Division, Food Allied Chemical Corp., N. Y.

In any area...in exterior house paints



Magnification: IX

ZINC OXIDE
MAKES THE DIFFERENCE

These panels have weathered three years on southern exposure in Chicago. The panel at left is coated with a standard house paint containing adequate zinc oxide . . . the other with a commercial zinc-free exterior paint. The latter surface is very badly eroded and offers no protection. The zinc-containing paint is still tight and sound.

The desirable resistance to erosion of paints formulated with zinc oxide are well known. But proper zinc oxide concentrations do much more:

Paints containing adequate ZnO resist staining by soluble dyes . . . withstand the destructive effects of ultraviolet light . . . resist mildew and spore growth . . . have better control of chalking. In short, ZnO lengthens the life, improves the service and appearance of any good paint.

For further information, write American Zinc Institute.

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292 Madison Avenue, New York 17, N. Y.

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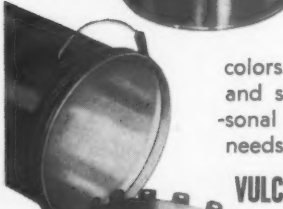
PAILS-DRUMS



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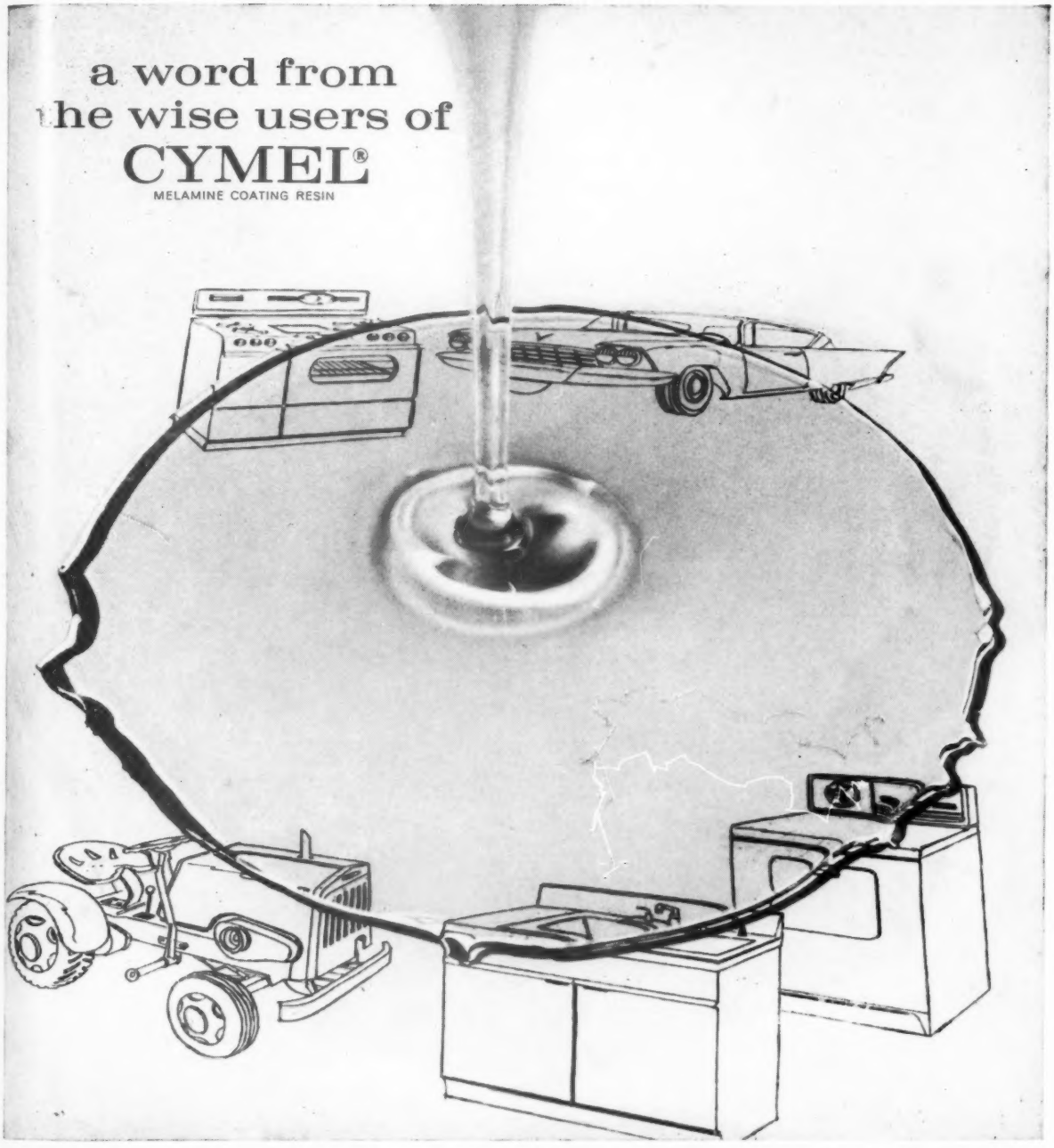

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